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STATE HIGHWAY COMMISSIONERS OF MICHIGAN.

Department created by Public Act 146, 1905.

Honorable Horatio S. Earle, 1905-1909	Detroit
Honorable Townsend A. Ely, 1909-1913	Alma
Honorable Frank F. Rogers, Elected, July, 1913	Lansing

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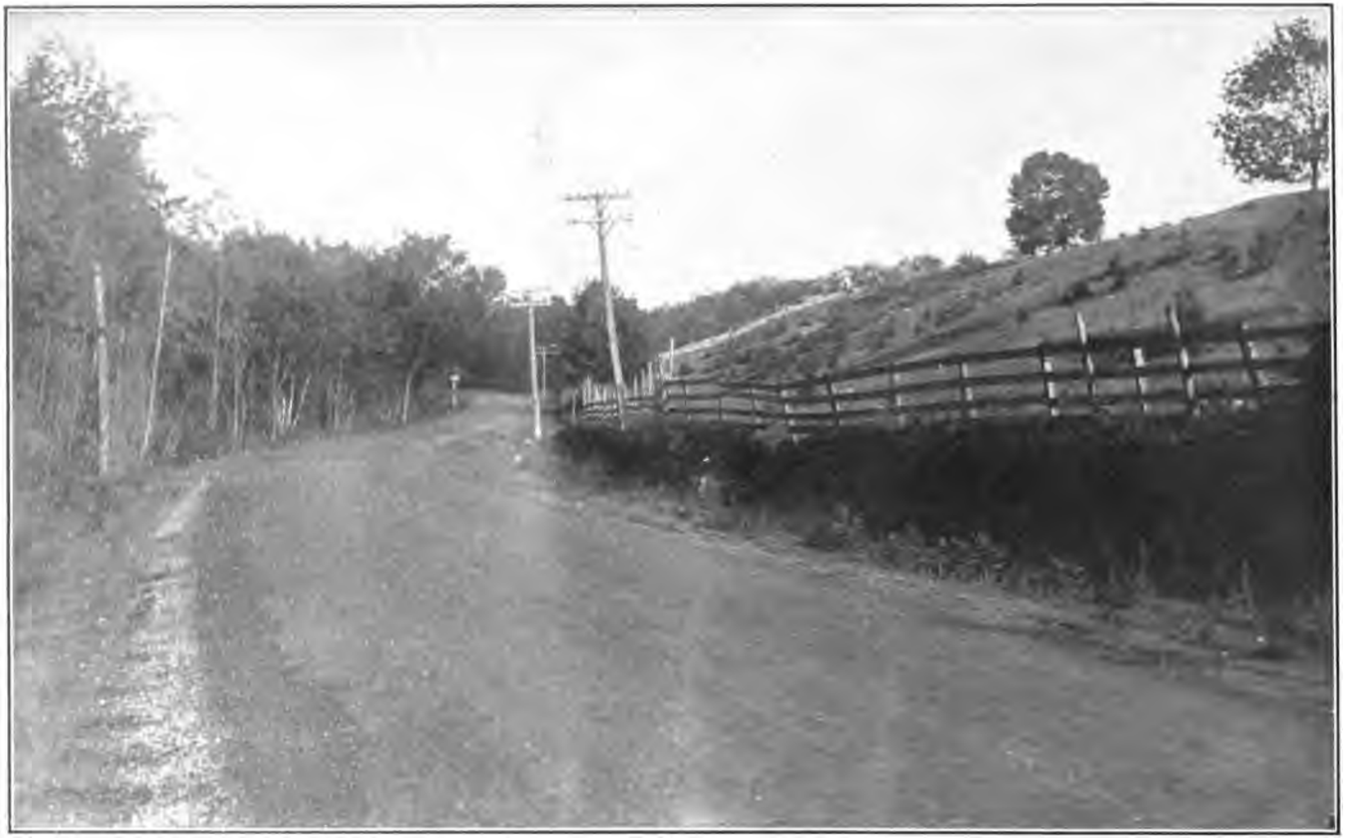

PETOSKEY-CHARLEVOIX ROAD.
Sixteen foot limestone road treated with bituminous material.

STATE OF MICHIGAN

SIXTH BIENNIAL REPORT

OF THE

STATE HIGHWAY COMMISSIONER

FOR TWO FISCAL YEARS

ENDING JUNE 30, 1916.

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LETTER OF TRANSMITTAL.

Honorable Woodbridge N. Ferris,
Governor:

In compliance with section 2, Chapter 5, Act 283, Laws of 1909, I have the honor to submit the sixth biennial report of the Michigan State Highway Department.

Very respectfully,
FRANK F. ROGERS,
State Highway Commissioner.

June 30th, 1916.

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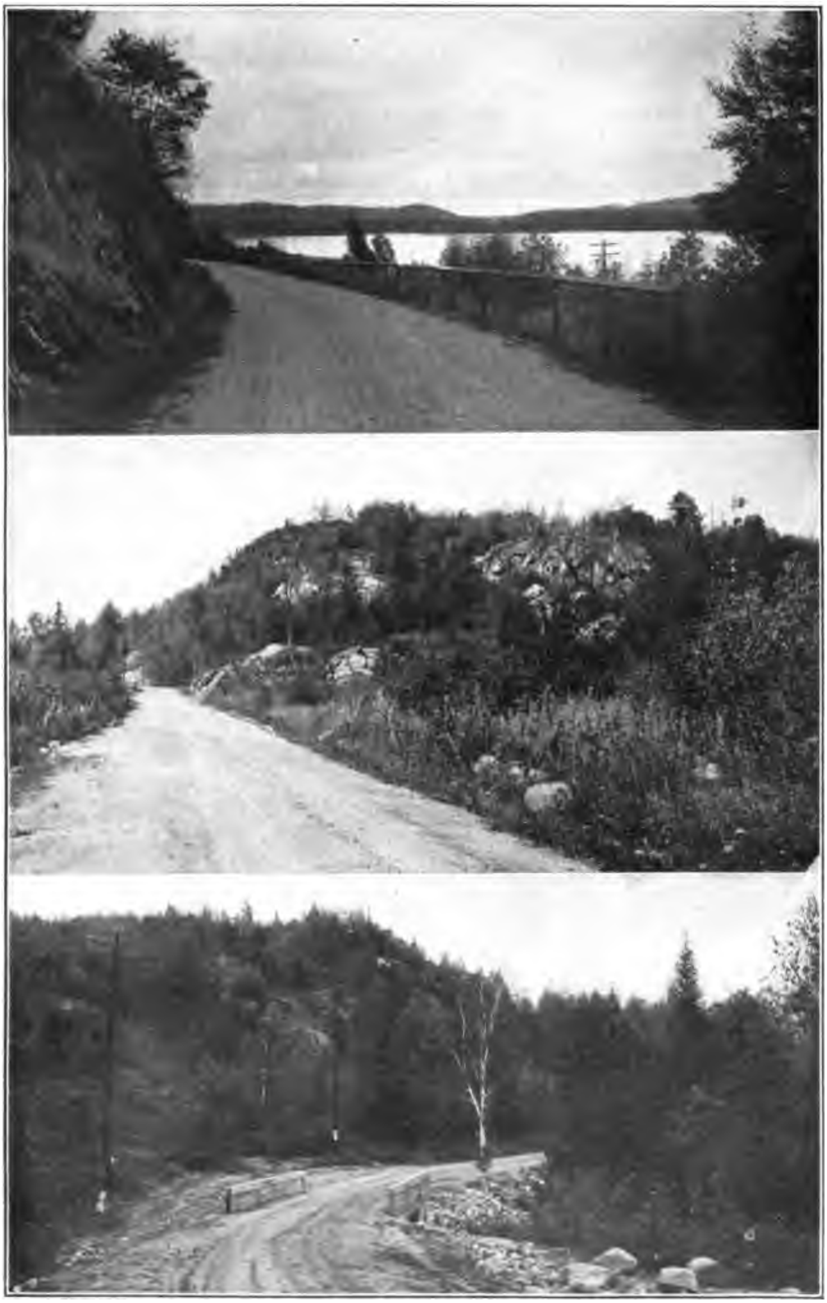


Gravel surfaced road along Lake Michigamme, Marquette county.

INTRODUCTION.

During the fiscal years 1915 and 1916, ending June 30, 1916, 1,851½ miles of road were accepted for state reward, making a total of 4,289 miles to date—an increase of 75 per cent in the total improved road mileage of the State. State reward was paid on only 1,503¼ miles, 348¼ miles being accepted but not rewarded because of lack of funds. During the same time 37 trunk line bridges were completed by the State, and the construction of 14 bridges was started. These in brief are the principal results accomplished by the State Highway Department with which this, the sixth biennial report, is concerned.

Much more has been done, however, than this brief statement includes. It has been the endeavor of the Department, by virtue of the power vested in it by the Legislature, to produce for Michigan a comprehensive system of through highways which will serve the State as a whole, together with country roads and feeders, all of which will satisfactorily carry the traffic imposed upon them for the least cost.

In the back cover will be found large two-colored maps of the upper and lower peninsulas showing the completed, projected and prospective roads. These maps show the centers of road building activity and the progress of road work in the state at a glance. The trunk lines are distinguishable since they offer continuous lines of travel over long distances. Completed roads are shown by heavy red lines, roads applied for are indicated by open red lines, while gaps in trunk lines are denoted by heavy green lines.

It is thought that many people have not a complete understanding of the field covered by the work of this Department nor of the amount and methods of expenditure of the public money placed at its disposal. For this reason, it is proper to preface the report with a description of the present organization for road administration and its relation to the road work of Michigan. Following this will be given a resume of the road work of the State and the status at the close of the 1914 fiscal year, which properly introduces the detailed report of the work of the Department during 1915 and 1916. The report will conclude with a recital of the outlook for the future, and recommendations for future work.

In presenting this report, it is desired to call attention to certain matters and developments relating to the construction of roads and bridges and to the work of the Department. Many of these points will be considered in more detail later, but it is hoped that, by taking them up here their importance may be further emphasized.

TRUNK LINE ROAD WORK.

A significant development during the period covered by this report is the increase in the number of trunk line roads and bridges built. The survey and supervision of these roads and the construction of the bridges, as provided by law, have constituted a large share of the activities of the Department and have made necessary large additions to the force.

On pages 62 and 63 will be found a table showing the status of trunk line construction to date, by counties. Compared with the results for 1914, the first year under the Trunk Line Act, when but 45 miles were built, the following totals are of considerable interest:

Allowable mileage	4,785.695
Mileage applied for	1,173.029
Mileage built	748.601
Total mileage built and applied for	1,921.630
Gaps	2,864.065

Thus it can be seen from the above that the work of establishing a comprehensive system of trunk line highways which will serve the State as a unit is well advanced. Section II contains detailed statements of the expenditures for trunk line purposes, the appropriations for which were $300,000 in 1915 and $350,000 in 1916.

GRAVEL ROAD BUILDING.

An examination of the tables given on pages 34 to 57, showing the number of miles of road built by classes, reveals the interesting fact that during the years 1915 and 1916, a total of 967¾ miles of gravel roads, constituting 65 per cent of the total mileage built during the same period, were constructed. This brings the total number of miles of gravel road accepted for state reward up to 2,538 miles or 60 per cent of all roads accepted.

The popularity of gravel roads in Michigan is due to a number of reasons. Large deposits of gravel suitable for road metal exist throughout the State, the utilization of which, in localities where the traffic is not so excessive as to cause high maintenance, is in accord with the best engineering practice. Considerable effort has accordingly been made by the Department to develop the most satisfactory methods for the construction of gravel roads. A new bulletin containing the latest recommendations and specifications of the Department for the construction of gravel roads has been prepared, and may be had upon application.

WATERBOUND MACADAM WITH BITUMINOUS SURFACE TREATMENT.

During the early existence of the Department, macadam roads constituted as much as 50 per cent of the mileage constructed. As the use of the automobile became more widespread, the percentage of macadam roads built each year decreased owing to the excessive cost of maintaining this type under the automobile traffic. Within the past two years, however, waterbound macadam roads have been again growing in favor because it has been found possible with a bituminous surface treatment to maintain them in a condition comparable in the point of service to the higher types of roads. The first treatment, which is made after the road has been "seasoned" by opening it to traffic for three or four months, is essentially a part of the initial cost of construction, and can be applied at a cost of about five cents per square yard or not to exceed $500 per mile for a 16 foot road. Thereafter the road can be maintained in a satisfactory condition with a yearly treatment at a cost of about three cents per square yard. Some of the counties in the western portion, notably Berrien County, have obtained excellent results with bituminous treatment.

ADDITIONS TO THE HIGHWAY LAWS.

Another matter which merits special attention is the additions to the highway laws made by the 1915 legislature. These acts took effect in August 1915 and made needed improvements in the highway system, created new means of getting roads, and greatly increased the activities of the Department. A brief review of the laws is given on pages 13 to 15 and the texts of the more important amendments are presented in Appendix B. Attention is also directed to important decisions of the Attorney General which are included in the same section. An account of the work of the Department under the new laws will be found on pages 17 and 18.

ORGANIZATION.

Under the highway laws now in force, the State's participation in road work is in charge of the State Highway Commissioner. The commissioner is elected by the people for a term of four years. He is empowered to appoint a deputy highway commissioner, who must be a competent civil engineer, experienced in highway building, and may employ such other assistants as are necessary.

The principal duties of the State Highway Department are as follows:

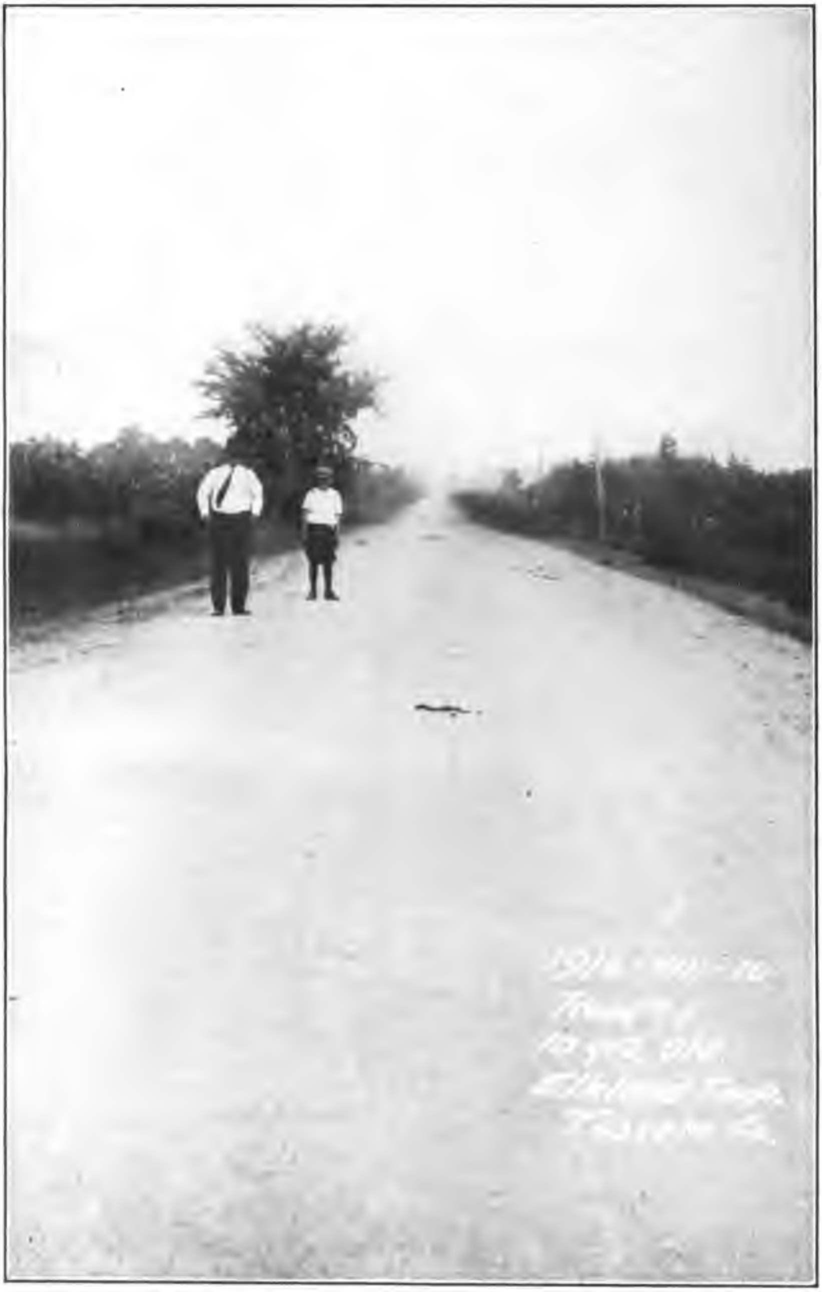
(1) The disbursing of funds appropriated by the State Legislature for the payment of state single reward and state trunk line reward on roads built by the counties and townships according to the specifications of the Department.

(2) The furnishing of plans and specifications for the construction of all roads, bridges and culverts upon state rewarded roads; the building of bridges greater than 30 foot span upon a state trunk line highway; the general supervision of all state reward road work.

(3) The collecting and furnishing of information relative to the construction of roads and bridges.

The local units of road work are the township, the road district, and the county. In counties where the township system is operative, road work is in charge of a township highway commissioner acting under the supervision of the township board. Road districts may be formed by any combination of townships, villages, or cities forming a continuous area in any county. In such districts, the road work is in charge of a board of good roads commissioners, consisting of one member from each township, incorporated village, or city included in the district. Under the county system, the work is in charge of a board of county road commissioners, not exceeding three in number. Fifty-nine counties of the State are now under the county road system.

State aid is extended in the form of rewards paid to local authorities for each mile of road constructed in accordance with the standards of the State Highway Department. There are seven classes varying from sand-clay to concrete and brick paved roads. The rewards vary from $250 to $1,700 per mile, which amounts are doubled if the road forms a part of the trunk line system. No one surveyed township is allowed more than four miles of road in any one year, except that in certain cases a township may be credited with the money earned,



State Reward Road No. 1. Ten years old. Built in Elkland township, Tuscola county, east of Cass City. Has been resurfaced once and is in good condition.

and may draw upon it as available until it has been paid. The law also provides that on or before December first of each year a portion of the appropriations equal to two per cent of the total state rewards that have been paid out at that time shall be credited to a repair fund which shall be paid out after December first of each year for repairs on state reward roads in the same manner as the rewards are paid. These rewards are in no case intended to cover the cost of constructing or maintaining the roads, but are in the nature of a reward to the county or township for properly maintaining the road.

The establishment of a system of trunk line highways is provided for. This system consists of about four thousand eight hundred miles of highways, which are defined in a general way by naming the cities and villages along the routes, but, for the most part, the exact lines to be followed between the towns are to be determined by the State Highway Commissioner after making such preliminary examinations and surveys as are deemed necessary. The act provides that double the legal reward shall be paid for the improvement of sections of road included in this system and that the State shall construct all bridges over thirty feet in span on these routes, provided the county shall build three miles of road including the bridge.

STATUS AT THE CLOSE OF THE 1914 FISCAL YEAR.

In order that the work of the period covered by this report may be better understood, there is introduced here a resume of the work up to and including the year 1914.

Michigan began to improve its roads under the state reward plan in 1906 (the 1906 fiscal year began July 1, 1905). Since that time, the miles of road completed up to 1914 and the expenditures are indicated as follows:

Year.	Miles built.	Total fund.	Trunk line fund.	Departmental expenses.
1906	18.00	$30,000	....	$10,000
1907	64.25	60,000	....	10,000
1908	96.50	110,000	....	10,000
1909	161.00	160,000	....	10,000
1910	204.50	150,000	....	10,000
1911	305.25	150,000	....	10,000
1912	382.75	245,000	....	10,000
1913	523.00	383,500	....	10,000
1914	682.32	650,000	$200,000	18,000
Totals	2,437.57	$1,938,000	$200,000	$98,000

In 1913 the legislature passed the Trunk Line Act which went into effect August first of that year, and carried with it an appropriation of $200,000 for 1914 and $300,000 for 1915. Although but 45 miles of trunk line highways were built during 1914, a large number of state reward roads already constructed on the trunk line routes laid out were given 50 per cent additional reward according to the provisions of the law. Extensive preliminary surveys were made to determine suitable routes. Twenty-two bridges, with an aggregate total cost of $75,203.73 were contracted for, in the construction of which an expense of $28,127.50 was incurred during the 1914 fiscal year. A balance of $28,339.92 was carried over to the 1915 fiscal year. The making of surveys, preparation of plans and maps, and supervising of bridge construction, as required by law, made necessary a large increase in the field and office force. Thus with 2,437.5 miles built, a comprehensive system of road improvement well under way, and a large and efficient organization developed, the Department entered upon the year 1915.

REPORT FOR THE 1915 AND 1916 FISCAL YEARS.

Because of the magnitude of the work, it is necessary for the most part, to resort to pictures and tabulated statements to tell of the activities of the Department and the results that have been accomplished. The pictures which are distributed throughout the report are representative. They are accompanied by explanatory matter and are worthy of careful attention. In Section II, pages 28 to 87, will be found detailed statements of all receipts and expenditures, complete tabulated records of all roads built and bridges constructed, as well as other tables of interest. Below is given a summary of the road construction during the period covered by this report.

SUMMARY OF ROAD CONSTRUCTION FOR 1915 AND 1916 FISCAL YEARS.

	Mileage.	Reward paid.	
		Single reward.	Trunk line.
Built to July 1, 1914	2,437.588	$1,628,485	$117,643
Built during 1915	758.778	583,895	199,671
Built during 1916	744.594	576,726	180,806
Totals	3,940.960*	$2,789,106	$498,120

*In addition to the above, 348.250 miles were accepted during the 1916 fiscal year, but on which the reward was not paid until after July 1, 1916 owing to the lack of funds. This would properly bring the total mileage up to 4,289.210 miles.

A REVIEW OF THE PRINCIPAL HIGHWAY LAWS AND AMENDMENTS MADE BY THE 1915 LEGISLATURE.

The Legislature of 1915 made important additions to the highway laws. These laws, with the exception of the automobile tax law, took effect on August 1, 1915. The text of the principal amendments is given in Appendix B together with important decisions of the Attorney General relating thereto. The complete copy of the highway laws may be had upon application.

County Road Map.—Section 18, Act No. 75, Public Acts of 1915, requires the county road commissioners in counties acting under the county road system, to file a map with the State Highway Commissioner showing the proposed county road system—not the roads they propose to build this year and next, but a comprehensive system connecting all the leading roads of the county which they intend will eventually be the county road system. This map should receive the approval of the State Highway Commissioner before recording it. The roads upon these lines which have been built by the townships should be taken over as county roads at the earliest possible moment and maintained as such.

County Highway Engineer.—Realizing the importance of engineering supervision of road work, the last Legislature made it mandatory for counties acting under the county system to employ a county highway engineer who shall have such general supervision of the county road work as shall insure plans and specifications being carried out, and the requirements fulfilled, whether done by contract or day labor.

Since counties spending less than $15,000 a year on road improvement would scarcely have sufficient work to employ an engineer regularly on a salary basis, it is advocated that the adjoining counties join in the employment of such a man, rather than employing one on the per diem basis. In this way, he is enabled to give his entire time to the work and is not interested in any other business, such as drain or land work which might be pressing him at a time when the county commissioners might need his services.

Election of County Road Commissioners.—County road commissioners were previously elected at the spring election. The Legislature thought it best to change this to a fall election so the commissioners would take office on the first of January, instead of the first of May in the midst of their building season.

Capacity of Bridges—The last Legislature changed the law relating to the capacity of bridges, raising it from ten tons to fifteen tons. A few years ago, the legal capacity of a bridge was six tons. It was later changed to ten tons moving load, similar to a ten ton traction engine. The last Legislature raised this to fifteen tons wisely, since the cost of building a fifteen ton capacity bridge over a ten ton capacity bridge is a small percentage. Probably a ten per cent increase in cost will provide for a fifteen ton loading over a ten ton. This does not necessarily sweep out all old bridges that have been constructed, but it does cover all new construction.

Elimination of Grade Crossings.—Grade crossings between heavily travelled highways and railroads have been the source of many serious accidents and the last Legislature provided a means of separating grades between highways and railroads. Upon petition of the county or township road officials to the State Railway Commission and the State Highway Commissioner, examination will be made of grade crossings, and hearings held with a view of determining whether a separation of grade would be possible and whether it would be economical and wise. The State Highway Commissioner and the State Railroad Commission act in the capacity of judges. The evidence showing that the grade should be separated must be presented by the local officials. The law provides that the maximum amount which the State may pay for the separation of grades is 25 per cent of the total cost.

Automobile Tax Law.—Much state-wide interest was manifested in the automobile tax law. Under the provisions of this law, the money collected from the sale of automobile licenses within the State is shared equally by the counties and the State Highway Department. All money returned to the counties must be used for highway maintenance or improvement.

No general appropriation for 1917 state rewards, except the trunk line appropriation, was made as it was intended that the money from the auto tax should take its place. The constitutionality of the law was contested in the courts and for a time the result was in doubt. The law was declared constitutional, however, by the Supreme Court

A gravel road between Battle Creek and Hastings, built by the Calhoun County Road Commission.

on May 12, 1916. Had the decision been unfavorable, road building in Michigan would have received a severe blow.

Between January 1 and June 30, 1916, $1,501,089.23 was collected by the Secretary of State, of which $767,602.22 was credited to the State Highway Department. This amount includes $34,114.85 received for special fees, which is not shared with the counties. On pages 64 and 65 will be found a table showing the distribution of the money to the several counties.

Maintenance of State Reward Roads.—An important amendment was passed relating to maintenance and repair of all state reward roads. If we build state reward roads and fail to keep them in repair, not only will their value be lost to a large extent, but the whole reward idea will fall into disfavor. This law attempts to provide a means which will insure that the state reward roads will be kept in suitable condition.

The law authorizes the State Highway Commissioner to withhold any rewards due a county or township until old state rewarded roads which are in poor condition, have been repaired in a satisfactory manner. If the local officials neglect or refuse to make the necessary repairs, the State Highway Commissioner is empowered to do so and to deduct the cost from any rewards due the county or township. If there be no rewards due, the State Highway Commissioner can repair the roads with State money and instruct the supervisors to include on the next tax roll an amount sufficient to reimburse the State. A statement of the conditions which must be fulfilled to obtain state repair reward may be found on pages 115 to 117.

Assessment District Act.—Among the most important highway laws passed by the last Legislature was the Assessment District Act, commonly known as the Covert Act, which provides a new means of getting roads where they are needed. Under the law, the property owners who represent 51 per cent of the frontage on any two miles of road may petition to the county road commissioners or to the State Highway Commissioner for the improvement of the road. The cost may be assessed upon the property benefitted. A pamphlet of the law may be had upon application to the Department.

GRAVEL ROAD BULLETIN.

The popularity of gravel roads, mention of which was made at the outset, has made necessary a third edition of the gravel road bulletin, which may be had upon application. In this bulletin, which has been extensively revised and rewritten, emphasis is laid upon a study of traffic requirements, adequate drainage, thorough dragging, and the inauguration of the patrol system of maintenance. Attention is directed to the new specifications for gravel roads.

NEW SPECIFICATIONS.

The Department has issued new specifications for Class B (gravel), Class E (macadam) and Class F (cement-concrete) roads. These specifications are given in Appendix A.

The grading and drainage requirements have been increased on all types. The acceptance of gravel roads for state reward has been made conditional upon the providing of a suitable road drag and the making of arrangements with some person to drag the road during the formative period. It is also required that at least 15 yards of gravel per mile be stocked in a neat pile for use in making repairs.

A condition of acceptance of macadam roads is that not less than 20 tons of two inch stone shall be stocked for each mile of road, to be used for repairs during the first year after the road is built.

The revised specifications for concrete roads provide for expansion joints only at points at which the work is stopped for more than thirty minutes, which is a notable change.

INVESTIGATION OF SAND-CLAY ROAD MATERIALS.

At the direction of the State Highway Commissioner, an extensive investigation was made during 1915 to determine to what extent Michigan's sand and clay are suitable for sand-clay road construction and to compile information as to the distribution of sand and clay in different communities throughout the State. The economy of this type of construction is evident when it is considered that in a great many cases, the metalled surface of the road can be made from a mixture of materials found along the road. Of course this type of road is not suitable for heavy traffic conditions although it has been found in other states, notably Georgia, on account of its low cost and ease of maintenance, to be highly satisfactory under quite severe traffic.

In those sections of Michigan where the soil is sandy and adapted for the sand-clay road, the traffic is usually light and these two factors combine to make the sand-clay road an economical type in many instances, although its construction cannot be recommended where good gravel is immediately available. The specifications of the Department for sand-clay roads are given in Appendix A, page 92.

The counties visited in making the investigation are given below. In Iosco, Gratiot, Mason, Osceola, and Lenawee counties, the conditions were quite favorable for sand-clay constructions, both as to the distribution and the quality of the materials. In Gladwin, Allegan, Dickinson, Iron, and Marquette counties, in general, the conditions were not such as to warrant the recommendation of the construction of sand-clay roads. Despite the unfavorable conditions Dickinson county is maintaining many miles of sand-clay roads in excellent condition by constant maintenance.

SEPARATION OF GRADES.

A number of petitions have been filed for the separation of grades under the new law. Two are under consideration at the time this report is made. One is on the Ann Arbor-Whitmore Lake road in Washtenaw County between a district road and the Michigan Central Railroad; the other is between a Houghton County road and the Mineral Range Railroad.

REPAIR OF STATE REWARD ROADS.

In order that Section 6 of Act 16, of the Public Acts of 1915 might be complied with, which provides that the State Highway Commissioner be authorized to compel the maintenance and repair of all roads in which state money has been invested, an inspection was made in the spring of 1916 of all old state rewarded roads. The local officials were advised as to what repairs were necessary to put the roads in proper shape.

The Department is confronted with the problem of how best to secure the hearty cooperation of all the local authorities in the maintenance and repair of these roads. It is far more desirable and agreeable that the county and township commissioners take notice of the repairs necessary, themselves, rather than that the Department force such matters to their attention. In many instances the road officials were ready and willing to make the repairs, but had not sufficient money. The automobile tax refund will, in most cases, furnish funds with which to properly repair the roads.

ASSESSMENT DISTRICT ROAD WORK.

The Assessment District Act met with immediate approval. It went into effect August 1 1915 and at the end of the fiscal year, June 30, 1916, approximately eight hundred miles of road had been petitioned for to the State Highway Commissioner.

The large number of petitions received has necessitated the establishment of a separate division of the Department to take care of the work, which for lack of space at the present time, is located in Committee Room J of the Capitol. Engineer L. H. Belknap has been placed in charge. The number of applications is greatly in excess of all expectations, and unforseen difficulties have arisen. It has been impossible to dispose of the bonds for construction, it being doubtful whether the State Highway Commissioner has the right to pledge the faith of the county. The act needs amending and the 1917 Legislature will be asked to make the necessary changes. Until this is done, however, little or perhaps no actual construction will be done by the State.

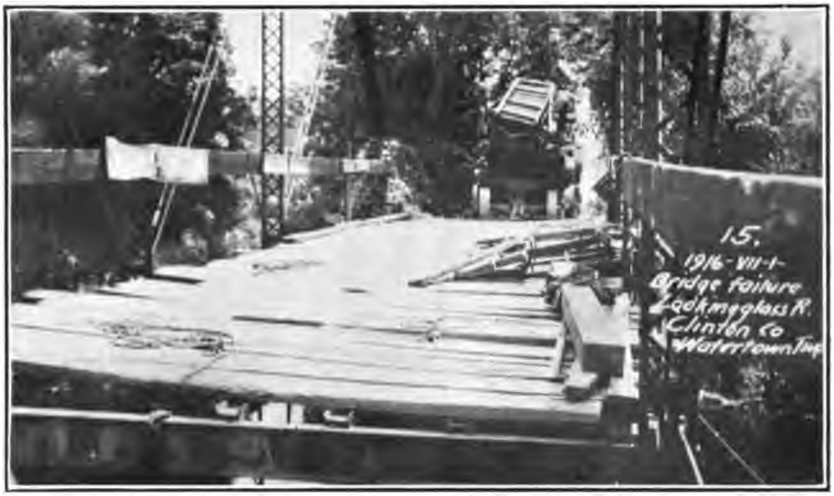
BRIDGE PROGRESS.

Much of the work of the past two years has been concerned with bridge construction. This work may be classified under two heads, (1) services rendered to counties and townships, and (2) construction of trunk line bridges.

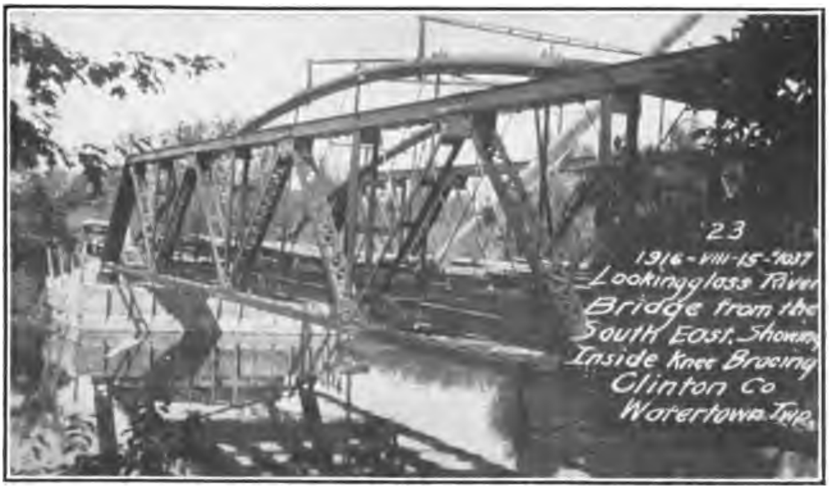
Standard Bridge Plans.—In connection with the furnishing of advice and designs to counties and townships, the bridge department has added to and greatly improved its standard plans for short span bridges and culverts. These are given in Appendix C. As one example of what has been accomplished by efficient design, it might be cited that in the standard reinforced concrete abutment it has been possible to effect a saving of from 30 to 50 per cent for heights from 20 to 25 feet above the top of the footing by an unusual combination of the principles of abutment design. For abutments of a greater height than ten feet, it has been found best to turn back a portion of the wing walls parallel with the roadway. The economy of this design over the cantilever abutment is due to the fact that stability is maintained by the general shape of the footing rather than by the width of the footing at any section.

A Comparison of Old and New Bridge Types.—The Department was called upon to inspect an interesting bridge failure which occurred on the bridge over the Looking Glass River, northeast of Eagle in Eagle township, Clinton county. The conditions surrounding this failure are applicable to many old highway bridges throughout the State, and served to bring to light the old constructional details. The circumstances surrounding the failure, together with an illustration are given on the opposite page and merit the careful consideration of all persons charged with the oversight of bridges of the same type.

In distinct contrast with the bridge which is mentioned above, is the bridge illustrated and described below on the opposite page, which was erected over the Looking Glass River east of Wacousta in Watertown township, Clinton county. The bridge is typical of the substantial structures which are being erected by or under the direction of the Department.



Failure of a bridge over the Looking Glass river in Eagle Township, Clinton county due to the turning of the stringers while a traction engine was crossing the bridge. The stringers were fastened to the floor beams by but one bolt through the flange at each end and the floor boards were not fastened down.



Construction photograph of a low truss bridge erected under the supervision of the Department over the Looking Glass river in Watertown township, Clinton county. The old bow-string span has been retained to aid in the erection.

Comparing the old and new standards of construction, it is interesting to note that the stringers on the new bridge are heavier than the floor beams on the old bridge previously described. An important constructional detail is that the stringers are rigidly framed into the floor beams and any movement is impossible. A second important feature is the inside knee braces. Three coats of paint are given the structure to prevent any early deterioration due to rust. Each coat is of a different color so that inspection may be readily made with a knife at any time. The photograph shows these framing details and also the old bow-string truss which was retained to serve in the erection of the new bridge. As an example of the way in which the future is being provided for, while the statutory limit of the capacity of bridges and culverts is fifteen tons, all bridges and culverts are designed by the Department to carry an eighteen ton roller or traction engine.

Trunk Line Bridges.—The results accomplished by the Department in the construction of trunk line bridges have been most noticeable. It has been left to the pictures of various bridges throughout the report to tell the story. Worthy of special mention, however, is the large reinforced concrete arch bridge which is now under construction just southwest of Grand Rapids. This bridge has a clear span of 60 feet and a 66 foot roadway. It is being built in conjunction with Kent County and the Grand Rapids, Holland and Chicago Railway, whose tracks occupy the center of the bridge. Also notable is the bridge designed to span the Huron River at French Landing in Wayne County. This bridge is a 130 foot deck Pratt truss which, with the concrete approaches, will make the total length over 400 feet. It has been the effort of the Department to design and construct bridges which will carry the greatest loads which may reasonably be expected to come upon them and will serve the community for a long period of years.

PUBLIC MEETINGS.

Not a small part of the work of the Department is the giving of instruction and information at various meetings, conventions, assemblies, etc., throughout the State from time to time. The instruction is usually offered in the form of papers presented by the several members of the Department.

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Expense Fund	30,000
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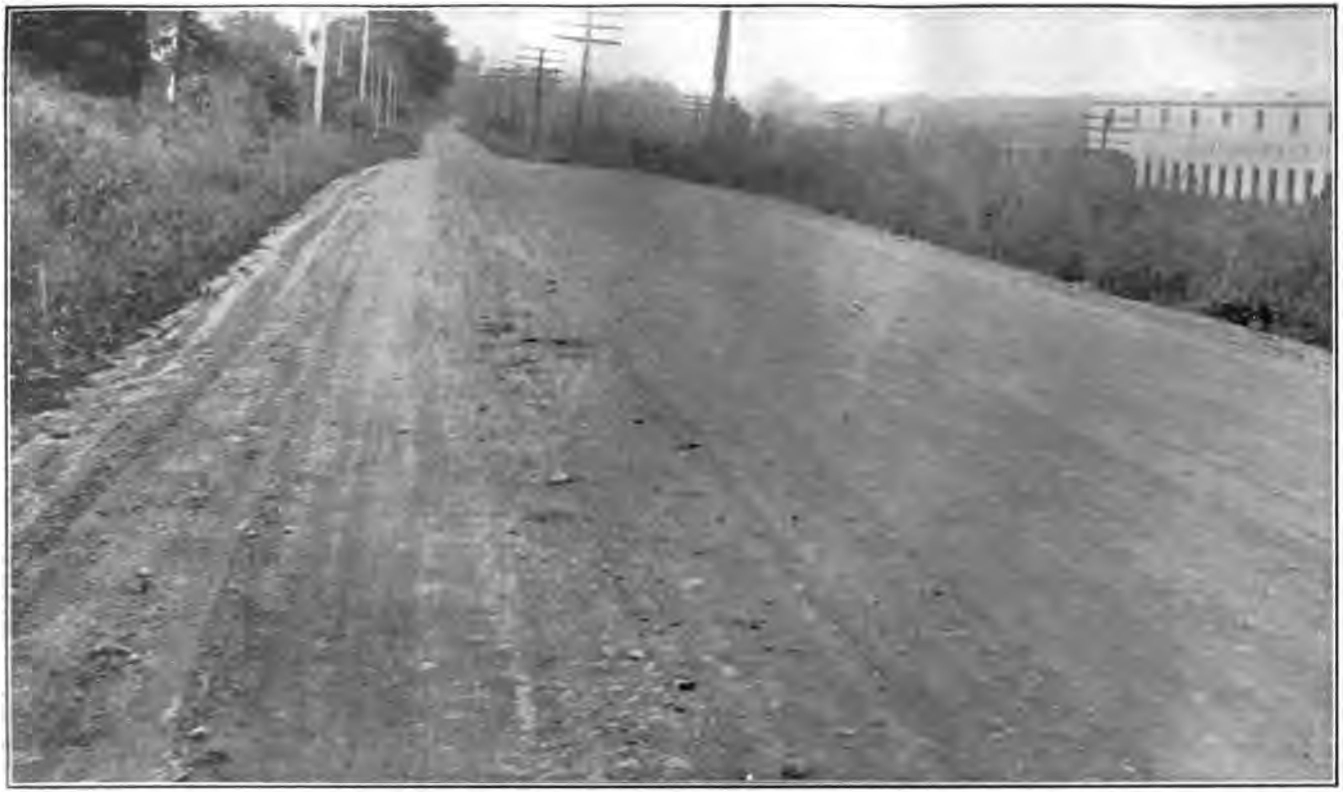
FEDERAL AID.

A new means of securing money for road construction was opened by the passage of the Federal Aid Road Bill. Federal aid in the construction of roads is at last a reality. This bill appropriates the sum of $75,000,000 for the construction of rural post roads in several states during the next five years, and $10,000,000 for the building of roads in the national parks. For the fiscal year ending June 30, 1917, the sum of $5,000,000 is appropriated and this amount is increased by $5,000,000 each succeeding year until the fiscal year ending June 30, 1921, for which year the appropriation is $25,000,000.

The appropriations are to be apportioned among the several states in the following manner: one-third in the ratio which the area of each bears to the total area of all the states; one-third in the ratio which the population of each state bears to the population of all the states; one-third in the ratio which the mileage of rural delivery routes and star routes bears to the total mileage of rural delivery and star routes in all the states.

The management and distribution of the road building fund will be in the hands of the Secretary of Agriculture. The act specifies that "no money apportioned under this act to any state shall be expended therein until its legislature shall have assented to the provisions of this act." The money will be expended through the State Highway Department. The Secretary of Agriculture cannot pay out any money on any road project until the plans, specifications, and estimates for such project have been submitted to him and approved; nor until he has received satisfactory assurance that the State has provided in money, labor and material an amount equal to the amount received from the United States; nor until satisfactory agreement shall have been made on the part of the State that the rural post roads built under the terms of this act will be properly maintained by the State. The Secretary of Agriculture cannot make any payment for road construction under the act in excess of $10,000 per mile, exclusive of the cost of bridges of more than 20 foot clear span.



A fifteen foot gravel road east of Kalamazoo, built by the Kalamazoo County Road Commission eight years ago. It shows some wear but is in a fair condition of repair today.

Michigan will profit to a large extent by the provisions of the Federal Aid Bill. The amounts to which this State will be entitled are as follows:

For the fiscal year ending June 30, 1917	$145,783 72
For the fiscal year ending June 30, 1918	291,567 44
For the fiscal year ending June 30, 1919	437,351 16
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For the fiscal year ending June 30, 1921	728,918 60
	$2,186,755 80

In order to arrive at an equitable distribution of the cost between the government, state, and counties, a unit known as the valuation per trunk line mile has been developed by dividing the assessed valuation of any county by the trunk line mileage within its borders. The values for this unit vary through a wide range from $25,233 to $16,320,156. Counties with an assessed valuation per trunk line mile of less than $100,000, of which there are 19, are classed together; those from $100,000 to $200,000 are placed in a second class, and so on up to those of $500,000 or more, of which there are 27. A schedule is proposed which would require the counties of the first class, which are the poorer counties, to pay 25 per cent and the State 25 per cent, while the government money will make up the remaining 50 per cent.

In each succeeding class, the county's share is increased by 5 per cent and that of the State decreased 5 per cent until those richer counties in the last class are required to pay the full 50 per cent.

The distribution which is offered will impose no hardships upon the poorer counties and should enable them to complete their trunk lines. The use of the federal money will reduce the cost to the State, hence the State can afford to increase the reward on the higher classes of roads which will materially aid the richer counties to build and maintain roads commensurate with their traffic. Thus the best interests of the whole State will be served, and the trunk line system of Michigan may be reasonably expected to be complete at the end of the five year period.

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The Highway Department now ranks among the largest of the state departments. Its appropriations make it one of the most important activities of the State. When duly installed in its new offices, it will be equipped in a manner commensurate with the magnitude of the work which comes to it and will be better able to serve the people of the State.

RECOMMENDATIONS.

The planning for and building of such a large mileage of roads involving the expenditure of vast sums of money, which, as has been shown, will take place in the future, involves a great deal of responsibility. Often in a task of this magnitude, certain important features are not given due consideration. There are vital requirements which must be met if the roads of the future are not only to receive state reward, but also to be economic roads which will at all times satisfactorily carry the traffic imposed upon them for the least annual cost. These requirements will be considered here.

SELECTION OF TYPES OF ROADS.

The selection of a road is often a vexing problem which is frequently not solved according to the best principles. The State Highway Department has never maintained that there is one best road in all places and under all conditions, but that in a system so large as to serve a whole state nearly every type of road has its place and the same is true of most counties.

A careful study of traffic conditions covering the amount and kind of traffic is necessary. After providing for future increases in traffic, the type should be selected on which the annual charges, taking into account the cost of construction, interest on that cost, the sinking fund, and the cost to satisfactorily maintain the road will be a minimum. Traffic upon a road varies with the distance from the cities and towns. From a careful study of traffic records, it has been found that the local traffic is on the average about 85 per cent of the total, while the touring traffic amounts to about 15 per cent of the total.

The thickly populated sections would require the best and most expensive types of roads, while in the sparsely settled regions, where the traffic is light, the cheaper type would suffice.

To give a specific illustration: On the Wolverine Pavedway, at a point half way between Lansing and East Lansing the travel amounts to over one thousand vehicles per day, while between East Lansing and Okemos on the same road, the travel falls down to four hundred vehicles per day, and at a point just east of Okemos the travel is only two hundred twenty-five vehicles per day. Bearing these facts in mind, it would seem unbusinesslike to construct the same type of road throughout the entire length of the highway.

A few miles out of each large city, where the number of vehicles per day exceeds four hundred, it undoubtedly would be advisable to construct a 16 foot cement-concrete or bituminous concrete road which would cost in the neighborhood of $14,000 or $15,000 per mile, with an average maintenance charge of $100 per mile per year. Beyond the four or five mile limit from the cities where the traffic reduces to from one hundred fifty to four hundred vehicles per day, a 16 foot gravel road costing from $5,000 to $6,000 per mile, with an annual maintenance charge of $100 to $200 per mile should suffice during the life time of one gravel surface. Farther from the cities and towns where the traffic goes both ways to market and reduces to less than one hundred fifty vehicles per day, even a less expensive road would be satisfactory for many years—say a nine foot or twelve foot gravel road costing from $2,000 to $3,000 per mile.

DRAINAGE.

No matter what type of road is selected, the road should be thoroughly and properly drained. If a cheaper type is selected, and adequate provisions are made for draining the road when the subgrade is constructed, the expense incurred will be more than repaid by the saving in maintenance, and a good foundation offered in case the road should be rebuilt later with a more expensive type. If an expensive type of pavement is used, proper drainage is imperative. In the latter case, the cost of drainage will be insignificant as compared with the total cost of the road, and longer life of the pavement is thereby insured.

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Comparing the old and new standards of construction, it is interesting to note that the stringers on the new bridge are heavier than the floor beams on the old bridge previously described. An important constructional detail is that the stringers are rigidly framed into the floor beams and any movement is impossible. A second important feature is the inside knee braces. Three coats of paint are given the structure to prevent any early deterioration due to rust. Each coat is of a different color so that inspection may be readily made with a knife at any time. The photograph shows these framing details and also the old bow-string truss which was retained to serve in the erection of the new bridge. As an example of the way in which the future is being provided for, while the statutory limit of the capacity of bridges and culverts is fifteen tons, all bridges and culverts are designed by the Department to carry an eighteen ton roller or traction engine.

Trunk Line Bridges.—The results accomplished by the Department in the construction of trunk line bridges have been most noticeable. It has been left to the pictures of various bridges throughout the report to tell the story. Worthy of special mention, however, is the large reinforced concrete arch bridge which is now under construction just southwest of Grand Rapids. This bridge has a clear span of 60 feet and a 66 foot roadway. It is being built in conjunction with Kent County and the Grand Rapids, Holland and Chicago Railway, whose tracks occupy the center of the bridge. Also notable is the bridge designed to span the Huron River at French Landing in Wayne County. This bridge is a 130 foot deck Pratt truss which, with the concrete approaches, will make the total length over 400 feet. It has been the effort of the Department to design and construct bridges which will carry the greatest loads which may reasonably be expected to come upon them and will serve the community for a long period of years.

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MAINTENANCE.

Closely related to the problem of drainage is that of maintenance. Not only must a road be properly built, but it must be properly maintained. This is especially true of our state reward roads. If we build these roads and fail to keep them in repair, the purpose of the whole plan is defeated. As an incentive to keep the state rewarded roads in repair, the reward idea was intended to cover maintenance, and the last Legislature, as has been cited, passed a law to compel this maintenance. It is not such a difficult thing as it may seem, to maintain a road. There is a right way and a wrong way to do it. The Department has prepared instructions on this subject which are given on page 115. The careful consideration of these instructions is earnestly requested.

CONCLUSION.

In conclusion we wish to thank Governor Ferris, the Legislature, and all the State Departments for their hearty cooperation. The Department is especially indebted to Attorney General Grant N. Fellows for his able assistance in the interpretation of the highway laws, and to the Board of State Auditors for providing new offices for the Department into which we expect to move before this report is published.

In preparing this report, it has been the endeavor to present a clear and comprehensive account of the work of the State Highway Department. This report is not, however, addressed only to those directly interested in and connected with the construction of roads. Through the Governor, it is addressed to all the people of the State of Michigan, for whose best interest the Department is laboring. The effort has been made to put forth a report of general interest with the hope that all may share the enthusiasm over road building that those directly charged with the work cannot help but feel, and that all will aid in the work whenever the opportunity is offered.

FRANK F. ROGERS,
State Highway Commissioner.

A sixteen foot gravel road on the Lansing-Detroit road east of W[illegible] [illegible] [illegible]
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A sixteen foot gravel road on the Lansing-Detroit road east of Williamston. Built by the Ingham County Road Commission.

SECTION II.

TABLES

TABLE NO. 1.—*Receipts and expenditures of State Reward Fund for fiscal year ending June 30, 1915.*

	Receipts.	Expenditures.
Balance in fund from 1914 fiscal year	$9,002 62	
Deficiency appropriation for 1915 fiscal year	600,000 00	
Disbursements (See Table 12)		$583,895 00
Repaid reward paid out		20,931 00
Balance in fund at close of 1915 fiscal year		4,176 62
	$609,002 62	$609,002 62

TABLE NO. 2.—*Receipts and expenditures of current expense fund for fiscal year ending June 30, 1915.*

	Receipts.	Expenditures.
Appropriation for 1915 fiscal year	$20,000 00	
Drawn from motor vehicle fund	1,823 75	
Salaries and per diem		$14,248 44
Traveling expenses and help		4,450 07
Reports, bulletins, postage, etc		2,544 22
Equipment for office and field work		60 99
Engineers' supplies		3 00
Stationery and office supplies		311 28
Sundries, telegraph, telephone, express, etc		197 59
On hand at close of 1915 fiscal year		8 16
	$21,823 75	$21,823 75

TABLE NO. 3.—*Receipts and Expenditures of Trunk Line Fund for fiscal year ending June 30, 1915.*

	Receipts.	Expenditures.	
Balance in fund from 1914 fiscal year	$28,339 92		
Appropriation for 1915 fiscal year	300,000 00		
From Alger County, share Bridge No. 17	400 00		
General Office Expense:			
Salaries (See Table 6)		$3,376 47	
Traveling expenses		62 59	
Equipment		4 46	
Stationery and supplies		68 94	
Report, bulletins, etc		338 11	
Sundries and liability insurance		259 73	
			$4,110 30
Road Inspection:			
Salaries (See Table 6)		$1,400 62	
Helpers and travel expenses		1,602 15	
			3,002 77
Surveys, Plans and Maps:			
Salaries (See Table 6)		$7,063 34	
Helpers and travel expense		10,070 47	
Equipment		264 60	
Supplies		1,946 56	
			19,344 97
Bridges:			
Salaries (See Table 6)		$8,592 01	
Travel, tests, proposal advertisements		4,106 79	
Equipment		282 97	
Supplies		246 33	
Construction		89,303 17	
			102,531 27

Road Rewards (See Table 12):		
New roads	$143,568 00	
Rebuilt roads	28,825 00	
Fifty per cent additional	27,278 00	
		$199,671 00
On hand at close of 1915 fiscal year		79 61
	$328,739 92	$328,739 92

TABLE NO. 4.—*Receipts and expenditures of Seney Road Fund for fiscal year ending June 30, 1915.*

	Receipts.	Expenditures.
Balance in fund from 1914 fiscal year	$33,762 70	
Freight refund from D. S. S. & A. Ry. Co	1,172 45	
Appropriation	25,000 00	
Expenditures during 1915 fiscal year		$34,045 24
On hand at close of 1915 fiscal year		25,889 91
	$59,935 15	$59,935 15

TABLE NO. 5.—*Salaries and per diem of employees of State Highway Department paid from current expense fund during fiscal year ending June 30, 1915.*

State Highway Commissioner, Frank F. Rogers	$2,500 00
Deputy Highway Commissioner, Leroy C. Smith	2,000 00
District Engineer, Wm. W. Cox	1,725 88
District Engineer, L. H. Neilsen	1,563 55
District Engineer, K. I. Sawyer	1,559 48
District Engineer, R. W. Roberts	1,477 00
Office Engineer, W. S. Cumming	1,080 00
Consulting Engineer, John J. Cox	18 00
Bookkeeper, Chas. S. Emery	1,060 00
Clerk and Stenographer, W. I. McCarthy	1,000 00
Clerk, Clara Rogers	42 00
Clerk, Mildred Rounds	15 75
Clerk, Gertrude Laverty	5 00
Messenger, Fred Rogers	157 25
Messenger, John Rich	44 53
	$14,248 44

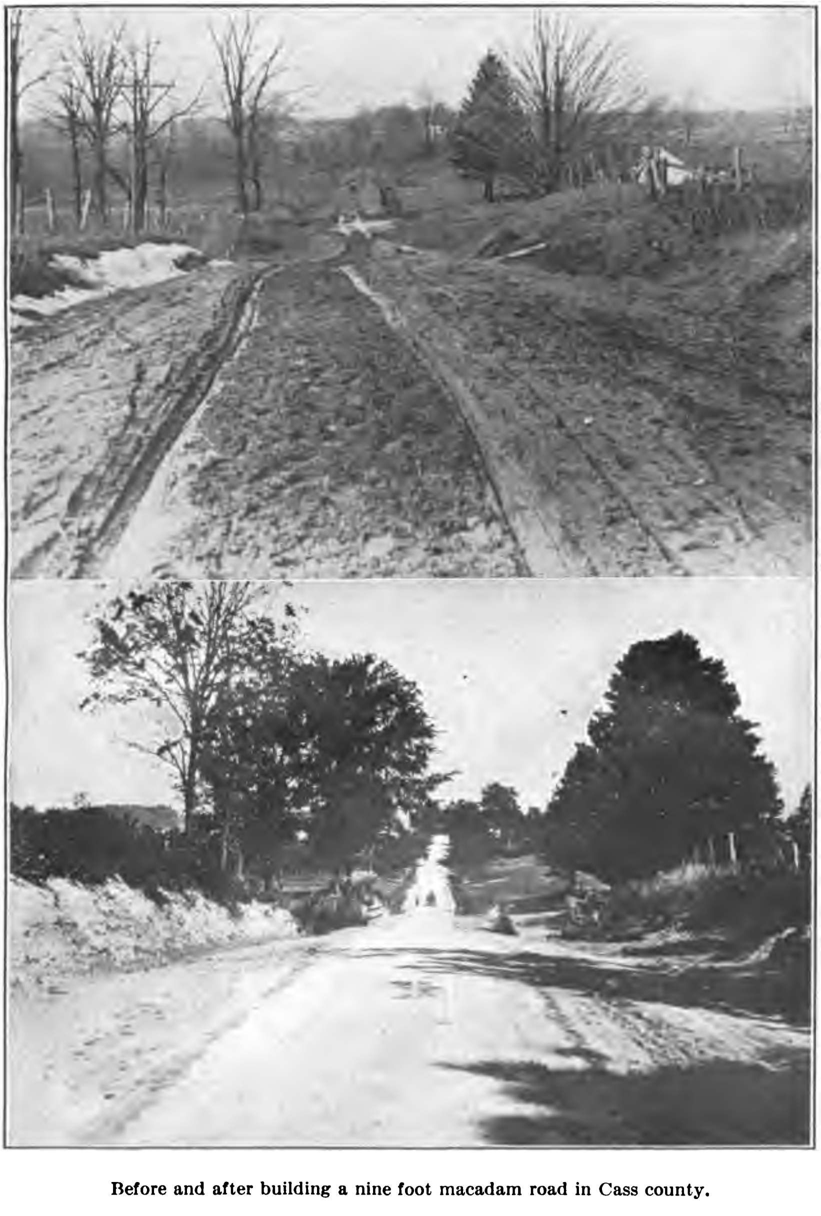
TABLE NO. 6.—*Salaries and per diem of employees engaged on trunk line work for State Highway Department for fiscal year ending June 30, 1915.*

General Office Expense:		
R. D. O'Keefe, Inspector	$1,310 41	
C. J. Neal, Draftsman	795 00	
F. D. Messenger, Draftsman	2 63	
F. C. Sharrow, Draftsman	21 88	
Fanny Rogers, Clerk	3 00	
Margaret Stoll, Clerk	8 00	
C. B. Purcell, Stenographer	68 43	
Ruth Ryan, Stenographer	598 24	
Marjorie Heil, Stenographer	487 26	
Lela Heil, Stenographer	27 17	
Lucile McCarthy, Stenographer	21 00	
Grace A. Reed, Stenographer	33 45	
		$3,376 .47
Road Inspection:		
G. C. Dillman, Inspector	$539 02	
R. D. O'Keefe, Inspector	127 80	
L. D. Townsend, Engineer	251 40	
L. H. Belknap, Engineer	251 40	
R. W. Roberts, Engineer	231 00	
		1,400 62

Surveys, Plans and Maps:		
H. L. Brightman, Chief Draftsman	$1,294 38	
L. D. Townsend, Locating Engineer	817 37	
L. H. Belknap, Locating Engineer	1,186 81	
G. C. Dillman, Engineer	496 49	
E. K. Lovelace, Engineer	958 81	
Chas. J. Neal, Engineer	221 28	
John Dennis, Draftsman	426 68	
M. L. Moone, Draftsman	780 90	
M. C. Hengst, Draftsman	291 91	
Lee Stockman, Draftsman	147 07	
C. E. Foster, Draftsman	16 40	
E. F. Dowd, Draftsman	32 73	
C. H. Hall, Draftsman	81 80	
F. C. Sharrow, Draftsman	13 13	
C. E. Thompson, Draftsman	8 58	
L. E. Belknap, Surveyor	122 92	
R. R. Cox, Rodman	105 48	
Fred Rogers, Rodman	60 60	
		$7,063 34
Bridges:		
C. V. Dewart, Bridge Engineer	$1,700 88	
Clarence S. Roe, Assistant Bridge Engineer	1,016 28	
E. H. Shuttleworth, Bridge Draftsman	1,016 28	
L. D. Townsend, Topographer	369 44	
L. B. Westerman, Bridge Inspector	793 01	
R. W. Newton, Bridge Inspector	579 73	
E. E. Kurtz, Bridge Inspector	746 14	
J. C. Alderdyce, Bridge Inspector	410 07	
W. J. Howard, Bridge Inspector	340 09	
Clifford Foster, Bridge Inspector	182 52	
H. M. Wood, Bridge Inspector	60 60	
Chas. L. Carter, Bridge Inspector	195 00	
H. F. Beyer, Bridge Inspector	172 23	
H. F. Rook, Bridge Inspector	154 72	
Fred Van De Laare, Bridge Inspector	188 39	
C. C. Therien, Bridge Inspector	225 98	
John Dennis, Bridge Inspector	112 52	
C. H. Hall, Bridge Inspector	60 64	
M. L. Moone, Bridge Inspector	37 09	
James Frost, Bridge Inspector	73 40	
Roy A. White, Bridge Inspector	98 94	
Harry J, Bill, Bridge Inspector	58 06	
		8,592 01
		$20,432 44

TABLE NO. 7.—*Receipts and expenditures of the State Reward Fund for the fiscal year ending June 30, 1916.*

	Receipts.	Expenditures.
Balance in fund from 1915 fiscal year	$4,176 62	
Appropriation for 1916 fiscal year	600,000 00	
Rewards, new and rebuilt roads (See Table 13)		$576,726 00
Repair rewards		27,447 48
On hand at the close of 1916 fiscal year		3 14
	$604,176 62	$604,176 62



Before and after building a nine foot macadam road in Cass county.

TABLE NO. 8.—*Receipts and expenditures of the Current Expense Fund for the fiscal year ending June 30, 1916.*

	Receipts.	Expenditures.
Balance in fund from 1915 fiscal year	$8 16	
Appropriation for 1916 fiscal year	25,000 00	
Drawn from Motor Vehicle Fund	1,129 94	
Salaries and per diem		$16,615 18
Traveling expenses and help		5,312 66
Reports, bulletins, postage, etc		2,548 79
Equipment for office and field work		86 44
Engineers' supplies		565 73
Stationery and office supplies		417 88
Sundries, telegraph, telephone, express, etc		186 27
On hand at close of 1916 fiscal year		405 15
	$26,138 10	$26,138 10

TABLE NO. 9.—*Receipts and expenditures of the Trunk Line Fund for the fiscal year ending June 30, 1916.*

	Receipts.	Expenditures.	
Balance in fund from 1915 fiscal year	$79 61		
Appropriation for 1916 fiscal year	350,000 00		
Refund from Seney Road Fund	9 90		
From Kent County, share of Bridge No. 58	3,000 00		
From G. R. Ry. Co., " " " " "	908 20		
General Office Expense:			
Salaries		$4,045 43	
Traveling expenses		15 91	
Equipment		14 00	
Stationery and supplies		274 23	
Reports, bulletins, etc		603 09	
Sundries, and liability insurance		264 19	$5,216 85
Expense incurred under Drain Law			44 74
Assessment District Law Expense:			
Salaries		$2,819 30	
Helpers and travel expenses		754 61	
Supplies		105 27	3,679 18
Road Inspection:			
Salaries		$5,031 41	
Helpers and travel expenses		3,270 98	8,302 39
Surveys, Plans and Maps:			
Salaries		$12,163 58	
Helpers and travel expenses		16,243 70	
Equipment		331 43	
Supplies		1,653 87	30,392 58
Bridges:			
Salaries		$11,849 98	
Travel, help, tests, proposal advertisements		6,012 42	
Equipment		318 69	
Supplies		512 17	
Construction		101,176 41	119,869 67
Road Rewards (See Table 13):			
New roads		$145,106 00	
Rebuilt roads		28,941 00	
Fifty per cent additional		6,759 00	
Repair rewards		4,721 10	185,527 10
On hand at close of 1916 fiscal year			965 20
	$353,997 71		$353,997 71

TABLE NO. 10.—*Receipts and expenditures of the Seney Road Fund for the fiscal year ending June 30, 1916.*

	Receipts.	Expenditures.
Balance in fund from 1915 fiscal year	$25,889 91	
Expenditures during 1916 fiscal year		$18,241 97
On hand at close of 1916 fiscal year		7,647 94
	$25,889 91	$25,889 91

TABLE NO. 11.—*Salaries and per diem of employees of State Highway Department for fiscal year ending June 30, 1916.*

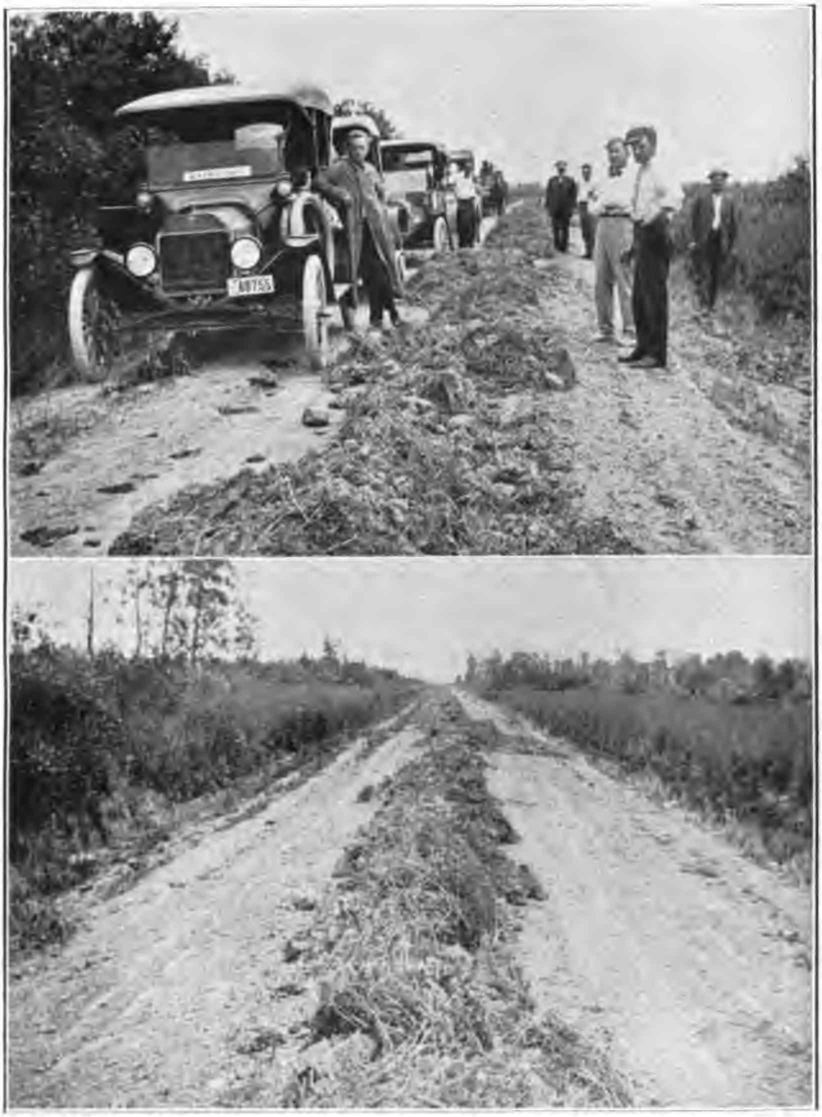
Current Expense Fund:		
General Administration:		
Frank F. Rogers, State Highway Commissioner	$2,500 00	
Leroy C. Smith, Deputy Highway Commissioner	2,000 00	
		$4,500 00
Clerical:		
W. S. Cumming	$600 00	
Chas. S. Emery	1,150 00	
W. I. McCarthy	1,000 00	
Fred Rogers	124 83	
John Rich	49 08	
Roy Hill	27 25	
Ralph Sweeney	19 83	
Leone E. Wheaton	90 34	
Ruth Whitman	65 75	
Elizabeth Mahoney	26 89	
Rosella Hughes	7 50	
Gladys Wade	32 10	
Marie McKernon	7 80	
Emma Sakrasky	4 50	
		3,205 87
Engineers:		
Wm. W. Cox	$1,874 12	
L. H. Neilson	1,803 55	
K. I. Sawyer	974 12	
G. C. Dillman	650 30	
S. B. Slack	234 72	
W. J. Cleary	17 50	
		5,554 31
Inspectors:		
R. D. O'Keefe	$1,500 00	
R. W. Roberts	1,827 00	
T. O. Williams	28 00	
		3,355 00
Trunk Line Fund:		
Clerical and Drafting:		
H. L. Brightman	$1,455 62	
J. H. Bateman	1,086 04	
C. H. Hall	1,092 74	
T. B. Dimmick	27 66	
R. H. Steketee	781 78	
C. T. Smith	667 67	
C. H. Blades	203 28	
Doyle Kimmel	19 74	
F. D. Messenger	567 06	
W. A. Reinert	44 53	
H. A. Morse	169 63	
L. L. Linton	473 08	
M. L. Moone	787 68	
E. F. Dowd	482 17	
T. L. Jackson	27 66	
H. H. Bartlett	282 18	
P. Weinlander	266 98	
F. C. Sharrow	2 45	

C. L. Williams	$117 33	
H. T. Davies	27 22	
J. Van Buren	193 08	
J. M. Harris	148 33	
H. A. Miles	719 00	
C. B. Morton	405 01	
V. B. Redfern	130 70	
Roy A. White	1,094 39	
M. Nourse	489 12	
Fred Rogers	196 82	
E. Dietrick	190 46	
Ruth Ryan	751 76	
Marjorie Heil	697 64	
Grace A. Reed	583 97	
E. Mahoney	107 13	
		$14,289 91
Engineers:		
C. V. Dewart	$1,874 12	
L. D. Townsend	1,661 79	
L. H. Belknap	1,661 79	
Clarence S. Roe	1,243 72	
E. K. Lovelace	1,216 19	
Chas. J. Neal	1,035 05	
G. C. Dillman	619 49	
W. S. Cumming	600 00	
		9,912 15
Inspectors and Surveyors:		
R. D. O'Keefe	$61 79	
E. E. Peterson	987 06	
L. P. Kelley	720 00	
L. E. Belknap	447 78	
C. N. Ward	14 82	
E. H. Shuttleworth	1,193 72	
W. J. Howard	798 69	
F. C. Chaddock	123 91	
R. R. Cox	123 19	
Chas. Cummings	161 54	
W. W. Lavers	113 69	
O. H. Vergeson	698 46	
V. R. Burton	973 44	
M. C. Hengst	932 17	
H. J. Bill	1,026 24	
J. H. Dennis	350 49	
C. D. Curtiss	83 94	
F. A. Walton	171 43	
M. H. Kinch	74 20	
C. E. Foster	674 67	
L. B. Westerman	1,041 19	
Jas. A. Raynsford	266 98	
R. W. Newton	668 24	
		11,707 64
Seney Road Fund:		
Engineers:		
Chas. J. Neal, Inspector	$216 00	
J. A. Broad	21 00	
F. J. Bell	161 60	
		398 60
		$52,923 48

TABLE NO. 12.—*Summary by counties for*

Note three lines to each county.

County.	Length in miles								
	Applications.							Built.	
	A.	B.	C.	D.	E.	F.	G.	A.	B.
Alger					13 563				
					6.963				
					20.526				
Allegan	.800	12.018	4.503		5.608			.800	1.304
		4 013	−1.000		5.361				2.242
	.800	16.031	3.503		10.969			.800	3.546
Alpena					3.042				
					3.042				
Antrim		70.624	1.004	4.663					42.733
		1 421		.624					7.438
		72.045	1.004	5.287					50.171
Arenac		2.023							2.023
		7.246							
		9.269							2.023
Barry		43.890							36.390
		2.940							4.500
		46.830							40.890
Bay	3.197	4.994	1.000		60.222	.161			.996
	−.990	5.896	10.057		14.037	1.000			3.740
	2.207	10.890	11.057		74.259	1.161			4.736
Benzie		87.975							45.189
	1.502	6.275			.748			1.502	11 264
	1.502	94.250			.748			1.502	56.453
Berrien	.250	8.027	1.000	2.375	67.881	1.169		.250	4.141
		−1.491			56.741				
	.250	6.536	1.000	2.375	124.622	1.169		.250	4.141
Branch		44.760							16.769
		9.438	1.506						17.480
		54.198	1.506						34.249
Calhoun		117.771	2.000		12.662				66.801
		29.992	8.921		.328				34.979
		147.763	10.921		12.990				101.780
Cass		34.790							22.472
		22.538	4.007						17.090
		57.328	4.007						39.562
Charlevoix		7.197			14.290				3.491
		12.697	.994		−3.021				5.956
		19.894	.994		11.269				9.447
Cheboygan		11.519	2.630	1.515	22.060				2.576
		−.898			20.751				1.000
		10.621	2.630	1.515	42.811				3.576
Chippewa									
					21.508				
					21.508				
Clare	1.494	30.396						1.000	13.975
		8.252	.999						6.762
	1.494	38.648	.999					1.000	20.737



Upper peninsula road enthusiasts drove from the western end of the upper peninsula to Mackinaw City to join with the West and East Michigan Pike Associations in dedicating a monument at the northern apex of the Dixie Highway. On their trip they encountered all kinds of road conditions. The above is an example of how not to grade a road.

fiscal year ending June 30, 1915.

Line one, total to July 1, 1914.
Line two, current year business.
Line three, total June 30, 1915.

by classes.					Reward paid in dollars.			
Built.					Single reward.		Trunk line.	
C.	D.	E.	F.	G.	County districts.	Township.	County.	Township.
....	....	8.551	....	....	$8.551	....	....	....
....	....	2.500	....	....	8,026	....	....	....
....	....	11.051	....	....	16,577	....	....	....
2.503	....	4.608	....	....	275	$7,088	....	....
....	....	....	....	....	1,263	....	....	....
2.503	....	4.608	....	....	1,538	7,088	....	....
....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....
1.004	4.663	....	....	....	....	25,615	....	
....	.624	....	....	....	....	5,108	....	$3,376
1.004	5.287	....	....	....	....	30,723	....	3,376
....	....	....	....	....	....	1,163	....	....
....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	1,163	....	....
....	....	....	....	....	....	18,898	....	1,706
....	....	....	....	....	....	2,687	....	1,062
....	....	....	....	....	....	21,585	....	2,768
1.000	....	57.419	.161	....	58,330	498	....	....
.445	....	3.761	1.000	....	6,965	750	$8,570	....
1.445	....	61.180	1.161	....	65,295	1,248	8,570	....
....	....	....	....	....	....	23,831	....	2,759
....	....	.748	....	....	....	7,286	....	3,215
....	....	.748	....	....	....	31,117	....	5,974
1.000	2.375	34.188	.889	....	15,192	26,854	....	....
....	....	28.867	....	....	37,015	1,300	4,469	4,150
1.000	2.375	63.055	.889	....	52,207	28,154	4,469	4,150
....	....	....	....	....	1,599	7,444	....	....
....	....	....	....	....	8,740	....	....	....
....	....	....	....	....	10,339	7,444	....	....
.340	....	8.959	....	....	9,588	34,799	2,997	....
1.320	....	2.277	....	....	18,129	4,350	4,054	....
1.660	....	11.236	....	....	27,717	39,149	7,051	....
....	....	....	....	....	....	11,236	....	....
2.075	....	....	....	....	6,000	4,101	....	....
2.075	....	....	....	....	6,000	15,337	....	....
....	....	6.273	....	....	6,273	1,746	....	....
....	....	2.500	....	....	6,069	....	1,576	....
....	....	8.773	....	....	12,342	1,746	1,576	....
2.630	1.515	8.222	....	....	12,619	....	....	....
....	....	5.425	....	....	6,748	....	....	....
2.630	1.515	13.647	....	....	19,367	....	....	....
....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	7,237	....	....
....	....	....	....	....	....	4,171	....	3,487
....	....	....	....	....	....	11,408	....	3,487

TABLE NO. 12.—

Note three lines to each county.

County.	Length in miles								
	Applications.							Built.	
	A.	B.	C.	D.	E.	F.	G.	A.	B.
Clinton.......	....	5.822	2.014	....	....	....	....	....	3.010
	....	25.037	4.692	....	....	....	....	....	1.202
	....	30.859	6.706	....	....	....	....	....	4.212
Crawford......	3.000	10.952	4.294	....	1.000	....	....	2.008	9.034
	1.980	1.000	2.378	....	1.042	....	....	2.972	1.904
	4.980	11.952	6.672	....	2.042	....	....	4.980	10.938
Delta.........	....	....	....	....	90.291	....	....	....	....
	....	....	....	....	8.878	....	....	....	....
	....	....	....	....	99.169	....	....	....	....
Dickinson.....	5.000	....	....	....	15.576	....	....	....	....
	....	.315	....	....	....	....	....	....	....
	5.000	.315	....	....	15.576	....	....	....	....
Eaton.........	....	97.193	....	....	....	....	....	....	61.171
	....	18.916	....	....	....	....	....	....	18.708
	....	116.109	....	....	....	....	....	....	79.879
Emmet........	....	14.747	....	.142	14.883	....	....	....	10.696
	....	3.362	....	....	....	....	....	....	3.548
	....	18.109	....	.142	14.883	....	....	....	14.244
Genesee.......	.678	185.849	14.957	13.411	11.901	....	....	.678	79.107
	....	25.613	2.420	−1.184	1.184	....	....	....	43.905
	.678	211.462	17.377	12.227	13.085	....	....	.678	123.012
Gladwin.......	26.000	1.004	....	....		....	....	....	.500
	−1.487	....	....	....	....	....	....	....	.504
	24.513	1.004	....	....	....	....	....	....	1.004
Gogebic.......	....	6.726	....	....	3.060	....	....	....	3.578
	....	6.642	....	....	....	....	....	....	....
	....	13.368	....	....	3.060	....	....	....	3.578
Grand Traverse	.920	48.557	....	4.611	1.000	....	....	.920	38.035
	....	23.045	.170	....	.512	....	....	....	10.796
	.920	71.602	.170	4.611	1.512	....	....	.920	48.831
Gratiot........	25.961	127.708	....	....		....	....	16.697	103.448
	8.482	8.878	....	....	....	....	....	5.488	9.012
	34.443	136.586	....	....	....	....	....	22.185	112.460
Hillsdale......	....	29.528	....	....	5.239	....	....	....	25.498
	....	12.546	....	....	8.991	....	....	....	2.524
	....	42.074	....	....	14.230	....	....	....	28.022
Houghton.....	....	....	....	....	15.513	....	....	....	....
	....	.890	2.220	....	6.226	....	....	....	.890
	....	.890	2.220	....	21.739	....	....	....	.890
Huron........	3.690	69.344	4.936	....	35.179	6.472	....	3.690	40.740
	....	22.713	....	....	.125	.596	....	....	21.619
	3.690	92.057	4.936	....	35.304	7.068	....	3.690	62.359
Ingham.......	.500	37.598	2.532	....	3.516	....	....	....	20.474
	....	26.780	2.062	....	−1.447	....	....	.500	6.480
	.500	64.378	4.594	....	2.069	....	....	.500	26.954
Ionia.........	....	41.420	....	....	....	....	....	....	27.384
	....	21.177	....	....	....	....	....	....	9.882
	....	62.597	....	....	....	....	....	....	37.266

CONTINUED.

Line one, total to July 1, 1914.
Line two, current year business.
Line three, total June 30, 1915.

by classes.					Reward paid in dollars.			
Built.					Single reward.		Trunk line.	
C.	D.	E.	F.	G.	County districts.	Township.	County.	Township.
						$1,505		
.663					$1,098			
.663					1,098	1,505		
4.294		1.000				9,239		
						1,695		
4.294		1.000				10,934		
		43.464			33,071	10,860		
		8.752			12,418	2,948	$16,062	
		52.216			45,489	13,808	16,062	
		15.576			12,796	2,780	5,421	
		15.576			12,796	2,780	5,421	
					5,217	25,369		
					6,691	3,013		
					11,908	28,382		
	.142	10.575			16,029		1,421	
		1.848			4,838		4,817	
	.142	12.423			20,867		6,238	
14.007	5.328	11.401			51,889	14,156	3,527	
1.448	5.066	1.684			29,475		1,871	
15.455	10.394	13.085			81,364	14,156	5,398	
					250			
					252			
					502			
		3.060			4.849		1.530	
		3.060			4.849		1.530	
	.313				8,972	11,713	2,841	
.170	.498				4,646	5,707	5,768	$251
.170	.811				13,618	17,420	8,609	251
						56,254		1,368
						5,879		2,004
						62,133		3,372
		4.489				17,442		
		5.240				6,695		
		9.729				24,137		
		11.924			15,077		11,742	
2.220		6.284			13,429		10,053	
2.220		18.208			28,506		21,795	
4.436		26.165	.500			51,584		800
		7.518	1.568			21,246		3,602
4.436		33.683	2.068			72,830		4,402
		2.000				12,237		
4.594		−1.186			3,937	2,291	1,425	
4.594		.814			3,937	14,528	1,425	
						13,692		
						5,291		1,289
						18,983		1,289

TABLE NO. 12.—

Note three lines to each county.

County.	Length in miles								
	Applications.							Built.	
	A.	B.	C.	D.	E.	F.	G.	A.	B.
Iosco.........	4.794	9.275	....	....	6.364	....	....	4.510	....
	4.262	2.406	....	....	−1.000	....	....	.986	1.500
	9.056	11.681	....	....	5.364	....	....	5.496	1.500
Iron..........	....	14.668	6.441	....	7.062	....	....	....	5.416
	....	23.102	6.117	....	....	....	....	....	....
	....	37.770	12.558	....	7.062	....	....	....	5.416
Isabella.......	....	66.512	....	....	....	....	....	....	51.986
	....	17.142	2.024	....	....	....	....	....	4.814
	....	83.654	2.024	....	....	....	....	....	56.800
Jackson.......	1.000	43.706	6.616	....	4.500	....	....	1.000	22.784
	1.188	25.379	.458	....	....	....	....	1.188	21.885
	2.188	69.085	7.074	....	4.500	....	....	2.188	44.669
Kalamazoo....	2.740	80.744	1.512	1.000	16.424	1.176	....	2.740	70.464
	....	12.093	−1.012	....	7.367	....	....	....	8.214
	2.740	92.837	.500	1.000	23.791	1.176	....	2.740	78.678
Kalkaska......	3.408	33.549	....	1.994	6.786	....	....	3.408	24.815
	....	5.090	....	....	....	....	....	....	7.776
	3.408	38.639	....	1.994	6.786	....	....	3.408	32.591
Kent..........	....	93.309	11.010	....	6.512	....	....	....	41.721
	....	12.112	−.502	....	.998	1.028	....	....	17.913
	....	105.421	10.508	....	7.510	1.028	....	....	59.634
Keweenaw.....	....	....	....	....	2.002	....	....	....	....
	....	....	....	....	3.588	....	....	....	....
	....	....	....	....	5.590	....	....	....	....
Lake..........	....	17.677	....	....	....	....	....	....	10.370
	....	1.250	....	....	....	....	....	....	....
	....	18.927	....	....	....	....	....	....	10.370
Lapeer........	1.004	28.779	4.512	....	....	....	....	....	16.993
	3.268	9.522	2.497	....	....	....	....	1.004	10.244
	4.272	38.301	7.009	....	....	....	....	1.004	27.237
Leelanau......	....	22.656	....	....	....	....	....	....	6.666
	....	....	....	....	....	....	....	....	3.082
	....	22.656	....	....	....	....	....	....	9.748
Lenawee......	....	....	....	....	2.160	....	....	....	....
	1.010	1.270	1.022	....	21.727	....	....	1.010	....
	1.010	1.270	1.022	....	23.887	....	....	1.010	....
Livingston.....	....	56.324	....	....	....	....	....	....	39.021
	....	22.842	5.000	....	....	....	....	....	7.662
	....	79.166	5.000	....	....	....	....	....	46.683
Luce..........	....	....	....	.999	....	....	....	....	....
	....	....	8.422	....	2.708	....	....	....	....
	....	....	8.422	.999	2.708	....	....	....	....
Mackinac.....	....	....	....	....	....	....	....	....	....
	....	7.750	....	....	7.992	....	....	....	....
	....	7.750	....	....	7.992	....	....	....	....
Macomb......	....	5.634	20.026	....	5.064	....	....	....	3.074
	....	−1.000	7.365	....	−.008	....	....	....	....
	....	4.634	27.391	....	5.056	....	....	....	3.074

Grading crews at work in Marquette county.

CONTINUED.

{ Line one, total to July 1, 1914.
Line two, current year business.
Line three, total June 30, 1915.

by classes.					Reward paid in dollars.			
Built.					Single reward.		Trunk line.	
C.	D.	E.	F.	G.	County districts.	Township.	County.	Township.
...	...	5.364	...	...	$5,826	$666	...	...
...	...	...	...	...	975	246	$2,915	$246
...	...	5.364	...	...	6,801	912	2,915	246
1.418	...	4.510	...	...	12,184	...	10,073	...
3.056	...	2.552	...	...	3,896	4,338	3,896	...
4.474	...	7.062	...	...	16,080	4,338	13,969	...
...	...	...	...	...		25,992	...	...
...	...	...	...	...	...	2,407	...	...
...	...	...	...	...	...	28,399	...	...
2.263	...	4.500	...	...	6,866	12,318	2,892	...
3.460	...	...	...	...	14,423	3,131	7,395	...
5.728	...	4.500	...	...	21,289	15,449	10,287	...
.500	1.000	11.301	.435	...	50,850	390	6,313	...
...	...	4.334	.741	...	10,778	...	3,242	...
.500	1.000	15.635	1.176	...	61,628	390	9,555	...
...	1.994	6.570	...	...	13,640	7,685	...	...
...	...	.216	...	...	1,628	2,476	...	...
...	1.994	6.786	...	...	15,268	10,161	...	...
...	...	2.997	...	...	*9,626	14,232	...	...
...	...	...	1.028	...	9,033	2,629	2,175	...
...	...	2.997	1.028	...	*18,659	16,861	2,175	...
...	...	2.002	...	...	...	2,002	...	...
...	...	...	...	...	...	...	...	...
...	...	2.002	...	...	...	2,002	...	...
...	...	...	...	...	...	5,185	...	...
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	5,185	...	...
1.502	...	...	...	...	4,224	5,512	...	...
4.509	...	...	...	...	5,640	3,114	...	...
6.011	...	...	...	...	9,864	8,626	...	...
...	...	...	...	...	...	3,333	...	...
...	...	...	...	...	...	1,737	...	849
...	...	...	...	...	...	5,070	...	849
...	...	...	...	...	...	...	...	...
...	...	1.024	...	...	...	1,735	...	...
...	...	1.024	...	...	...	1,735	...	...
...	...	...	...	...	...	19,511	...	817
...	...	...	...	...	...	4,309	...	1,372
...	...	...	...	...	...	23,820	...	2,189
...	.999	...	...	...	750	...	...	...
...	...	...	...	...	...	...	...	...
...	.999	...	...	...	750	...	...	...
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...
5.777	...	2.000	...	...	8,019	2,537	5,015	...
8.218	...	1.752	...	...	11,817	...	1,355	...
13.995	...	3.752	...	...	19,836	2,537	6,370	...

TABLE NO. 12.—

Note three lines to each county.

County.	Length in miles								
	Applications.							Built.	
	A.	B.	C.	D.	E.	F.	G.	A.	B.
Manistee......	1.120	83.206	....	....	5.344	....	....	1.000	52.195
	....	12.042	....	1.023	−1.023	....	....	.120	6.106
	1.120	95.248	....	1.023	4.321	....	....	1.120	58.301
Marquette.....	....	....	5.020	....	12.627	....	....	....	....
	1.213	....	.008	....	6.309	....	....	....	....
	1.213	....	5.028	....	18.936	....	....	....	....
Mason.........	1.992	85.143	....	.500	21.156	....	....	1.000	35.227
	....	21.966	....	....	....	....	....	.500	11.124
	1.992	107.109	....	.500	21.156	....	....	1.500	46.351
Mecosta.......	....	75.790	....	....	....	....	....	....	60.680
	....	11.032	....	....	....	....	....	....	9.640
	....	86.822	....	....	....	....	....	....	70.320
Menominee....	....	28.732	26.691	4.734	10.657	....	....	....	19.488
	1.002	4.742	2.285	.174	....	....	....	1.002	....
	1.002	33.474	28.976	4.908	10.657	....	....	1.002	19.488
Midland.......	2.126	15.656	2.482	....	19.399	....	....	1.000	5.460
	7.529	−2.060	4.032	....	4.652	....	....	....	....
	9.655	13.596	6.514	....	24.051	....	....	1.000	5.460
Missaukee.....	....	21.810	8.265	....	1.500	....	....	....	11.304
	....	13.039	2.778	.171	1.325	....	....	....	10.222
	....	34.849	11.043	.171	2.825	....	....	....	21.526
Monroe.......	....	....	2.102	....	45.500	....	....	....	....
	....	.092	1.004	....	21.190	....	....	....	....
	....	.092	3.106	....	66.690	....	....	....	....
Montcalm.....	4.097	83.425	....	....	....	....	....	2.089	60.627
	....	16.636	....	....	....	....	....	1.000	13.921
	4.097	100.061	....	....	....	....	....	3.089	74.548
Muskegon.....	2.776	21.555	6.719	....	40.317	....	....	2.016	18.517
	1.018	2.904	−5.442	....	6.919	....	....	1.018	.500
	3.794	24.459	1.277	....	47.236	....	....	3.034	19.017
Newaygo......	....	51.811	.307	....	8.745	....	....	....	24.673
	....	18.739	....	....	....	....	....	....	13.949
	....	70.550	.307	....	8.745	....	....	....	38.622
Oakland.......	....	69.359	17.290	2.107	3.490	1.317	....	....	23.659
	....	1.126	4.817	....	....	3.016	....	....	9.208
	....	70.485	22.107	2.107	3.490	4.333	....	....	32.867
Oceana........	....	24.261	....	....	61.607	....	....	....	11.435
	1.489	1.030	....	....	1.298	....	....	....	3.617
	1.489	25.291	....	....	62.905	....	....	....	15.052
Ogemaw.......	....	9.068	2.982	....	....	....	....	....	5.056
	....	28.580	−1.239	....	.246	....	....	....	3.495
	....	37.648	1.743	....	.246	....	....	....	8.551
Ontonagon....	....	....	....	....	8.566	....	....	....	....
	4.000	....	....	....	.984	....	....	4.000	....
	4.000	....	....	....	9.550	....	....	4.000	....
Osceola.......	....	55.989	1.750	.556	5.474	....	....	....	27.337
	....	2.132	2.135	....	....	....	....	....	2.438
	....	58.121	3.885	.556	5.474	....	....	....	29.775

CONTINUED.

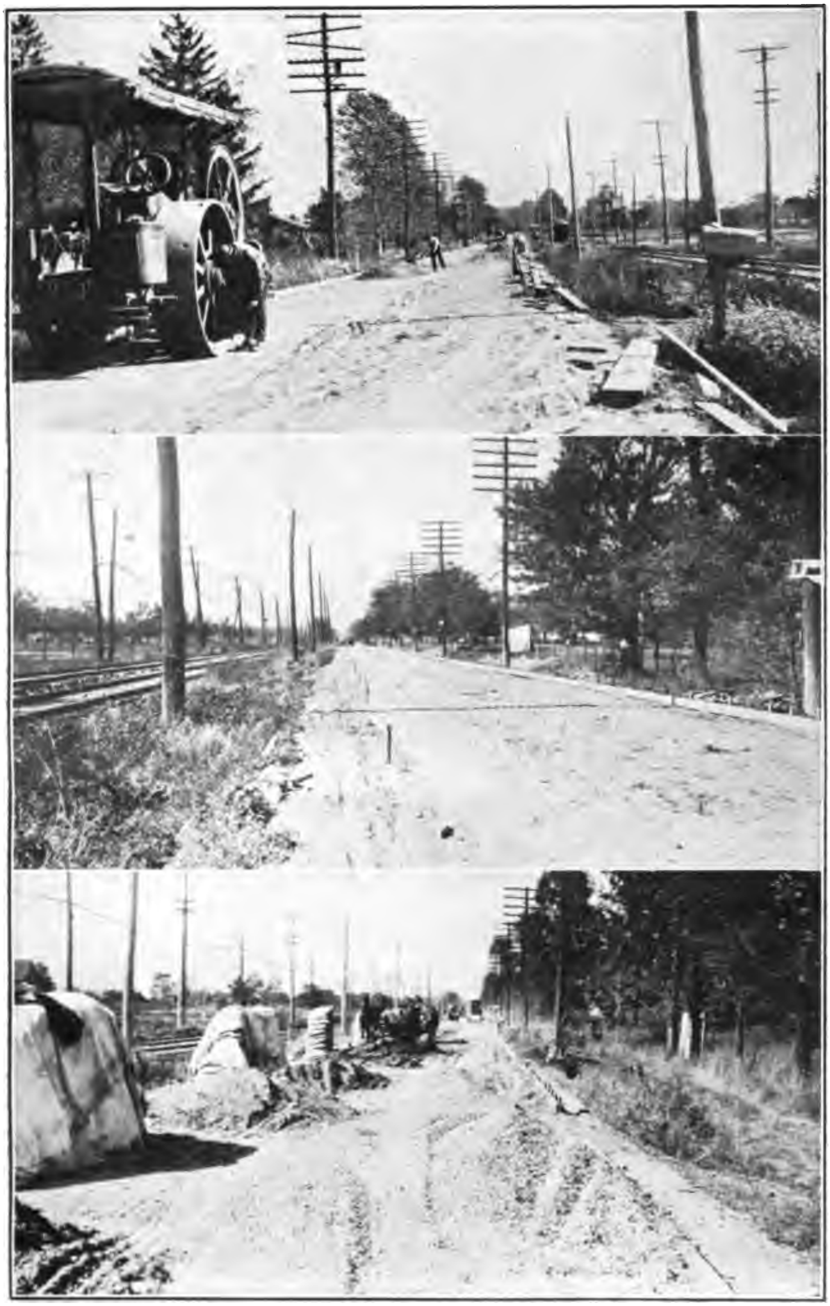
Line one, total to July 1, 1914.
Line two, current year business.
Line three, total June 30, 1915.

by classes.					Reward paid in dollars.			
Built.					Single reward.		Trunk line.	
C.	D.	E.	F.	G.	County districts.	Township.	County.	Township.
....	....	2.587	....	....	$22,620	$6,315	$1,360	....
....	1.023	1.731	....	....	3,987	3,583	4,552	....
....	1.023	4.318	....	....	26,607	9,898	5,912	....
....	....	12.040	....	....	12,040	....	5,784	....
1.924	....	2.427	....	....	3,119	2,834	3,120	....
1.924	....	14.467	....	....	15,159	2,834	8,904	....
....	.500	13.972	....	....	27,187	5,023	....	....
....	....	....	....	....	3,687	2,000	700	....
....	.500	13.972	....	....	30,874	7,023	700	....
....	....	....	....	....	12,488	17,852	....	....
....	....	....	....	....	2,078	3,335	2,080	....
....	....	....	....	....	14,566	21,187	2,080	....
8.800	....	7.393	....	....	17,582	6,155	....	....
6.058	....	1.000	....	....	9,850	....	9,850	....
14.858	....	8.393	....	....	27,432	6,155	9,850	....
....	....	....	....	....	....	2,980	....	....
3.486	....	5.976	....	....	1,862	6,729	....	$2,972
3.486	....	5.976	....	....	*1,862	9,709	....	2,972
8.265	....	1.045	....	....	3,521	9,375	....	....
1.988	.171	.890	....	....	3,872	3,749	....	....
10.253	.171	1.935	....	....	7,393	13,124	....	....
....	....	28.387	....	....	....	29,889	....	....
1.000	....	7.996	....	....	825	12,394	....	....
1.000	....	36,383	....	....	825	42,283	....	....
....	....	....	....	....	....	30,913	....	....
....	....	....	....	....	....	7,211	....	....
....	....	....	....	....	....	38,124	....	....
.931	....	39.003	....	....	43,692	6,183	7,781	....
....	....	4.181	....	....	5,428	372	8,775	....
.931	....	43.184	....	....	49,120	6,555	16,556	....
....	....	8.745	....	....	....	21,081	....	....
.307	....	....	....	....	....	8,165	....	4,646
.307	....	8.745	....	....	....	29,246	....	4,646
....	1.000	2.004	....	....	....	14,634	....	641
3.004	1.107	....	.123	....	6,718	3,691	2,625	2,883
3.004	2.107	2.004	.123	....	6,718	18,325	2,625	3,524
....	....	49.450	....	....	....	57,417	....	1,990
....	....	1.966	....	....	....	3,775	....	....
....	....	51.416	....	....	....	61,192	....	1,990
....	....	....	....	....	2,528	....	....	....
....	....	....	....	....	1,896	....	645	....
....	....	....	....	....	4,424	....	645	....
....	....	2.566	....	....	2,000	566	....	....
....	....	6.000	....	....	....	7,000	....	5,000
....	....	8.566	....	....	2,000	7,566	....	5,000
1.000	....	4.971	....	....	....	19,390	....	375
.126	.556	.503	....	....	....	2,233	....	....
1.126	.556	5.474	....	....	....	21,623	....	375

TABLE NO. 12.—

Note three lines to each county.

County.	Length in miles								
	Applications.							Built.	
	A.	B.	C.	D.	E.	F.	G.	A.	B.
Oscoda	....	....	....	....	....	....	....	....	....
	1.000	....	....	....	....	....	....	....	....
	1.000	....	....	....	....	....	....	....	....
Ottawa	....	46.279	....	....	2.280	....	....	....	9.128
	....	102.901	2.008	....	.982	.500	....	....	4.827
	....	149 180	2.008	....	3.262	.500	....	....	13.955
Presque Isle	....	3.890	....	....	....	....	....	....	1.020
	....	....	....	....	....	....	....	....	2.870
	....	3.890	....	....	....	....	....	....	3.890
Roscommon	....	4.490	....	....	....	....	....	....	4.490
	....	....	....	....	....	....	....	....	....
	....	4.490	....	....	....	....	....	....	4.490
Saginaw	2.032	10.171	1.522	....	156.870	....	....	2.032	6.321
	....	17.247	....	....	28.219	1.088	....	....	....
	2.032	27.418	1.522	....	185.089	1.088	....	2.032	6.321
Sanilac	....	42.619	....	....	10.499	....	....	....	15.909
	....	15.492	....	....	4.008	....	....	....	8.530
	....	58.111	....	....	14.507	....	....	....	24.439
Schoolcraft	....	2.250	....	....	15.010	....	....	....	....
	....	4.250	....	....	4.500	....	....	....	....
	....	6.500	....	....	19.510	....	....	....	....
Shiawassee	3.880	70.250	....	....	....	....	....	2.494	39.490
	....	45.102	....	....	....	....	....	.890	14.454
	3.880	115.352	....	....	....	....	....	3.384	53.944
St. Clair	.746	18.134	....	....	36.846	.506	....	....	3.740
	1.558	....	....	....	3.183	....	....	....	1.014
	2.304	18.134	....	....	40.029	.506	....	....	4.754
St. Joseph	1.000	16.596	2.582	....	5.208	....	....	1.000	4.644
	2.596	11.881	....	....	2.004	....	....	1.004	7.612
	3.596	28.477	2.582	....	7.212	....	....	2.004	12.256
Tuscola	....	97.788	9.000	....	5.500	....	....	....	70.770
	....	15.064	2.238	....	8.843	....	....	....	15.482
	....	112.852	11.238	....	14.343	....	....	....	86.252
Van Buren	3.045	21.283	4.698	....	18.575	....	....	2.545	17.607
	−.750	3.994	3.815	....	1.774	....	....	−.250	2.446
	2.295	25.277	8.513	....	20.349	....	....	2.295	20.053
Washtenaw	....	22.148	3.088	....	....	....	....	....	2.464
	....	....	....	....	....	....	....	....	13.317
	....	22.148	3.088	....	....	....	....	....	15.781



Preparing subgrade, setting forms, and stocking materials for an eighteen foot concrete road between Lansing and East Lansing, Ingham county.

CONTINUED.

Line one, total to July 1, 1914.
Line two, current year business.
Line three, total June 30, 1915.

by classes.					Reward paid in dollars.			
Built.					Single reward.		Trunk line.	
C.	D.	E.	F.	G.	County districts.	Township.	County.	Township.
......	......	......	......	......	......	......	......	......
......	......	......	......	......	......	......	......	......
......	......	......	......	......	......	......	......	......
......	......	1.000	......	......	$3,775	$2,541	......	......
......	......	......	......	......	3,714	......	$2,453	......
......	......	1.000	......	......	7,489	2,541	2,453	......
......	......	......	......	......	......	510	......	......
......	......	......	......	......	......	2,088	......	......
......	......	......	......	......	......	2,598	......	......
......	......	......	......	......	......	2,245	......	......
......	......	......	......	......	......	......	......	......
......	......	......	......	......	......	2,245	......	......
1.522	......	119.260	......	......	119,835	4,235	2,470	......
......	......	10.378	1.088	......	12,209	......	5,622	......
1.522	......	129.638	1.088	......	132,044	4,235	8,092	......
......	......	6.496	......	......	......	14,450	......	......
......	......	3.506	......	......	......	9,271	......	$4,000
......	......	10.002	......	......	......	23,721	......	4,000
......	......	11.990	......	......	12,819	......	5,113	......
......	......	......	......	......	......	......	......	......
......	......	11.990	......	......	12,819	......	5.113	......
......	......	......	......	......	8,765	12,381	1,701	......
......	......	......	......	......	5,394	2,737	1,653	......
......	......	......	......	......	14,159	15,118	3,354	......
......	......	18.752	.506	......	......	21,128	......	......
......	......	2.936	......	......	5,617	507	9,310	......
......	......	21.688	.506	......	5,617	21,635	9,310	......
......	......	.500	......	......	1,697	1,375	......	......
1.894	......	1.470	......	......	6,841	502	535	......
1.894	......	1.970	......	......	8,538	1,877	535	......
1.000	......	1.750	......	......	*2,812	35,372	......	......
1.999	......	2.000	......	......	......	13,341	......	5,423
2.999	......	3.750	......	......	*2,812	48,713	......	5,423
......	......	6.351	......	......	......	16,662	......	2,263
1.000	......	3.877	......	......	......	7,685	......	4,610
1.000	......	10.228	......	......	......	24,347	......	6,875
......	......	......	......	......	......	1,232	......	......
2.046	......	......	......	......	10,215	407	2,111	......
2.046	......	......	......	......	10,215	1,639	2,111	......

TABLE NO. 12.—

Note three lines to each county.

County.	Length in miles								
	Applications.							Built.	
	A.	B.	C.	D.	E.	F.	G.	A.	B.
Wayne........	....	12.745	14.120	....	9.984	99.562	....	....	12.118
	....	1.124	....	....	−1.092	15.530	.104	....	1.002
	....	13.869	14.120	....	8.892	115.092	.104	....	13.120
Wexford.......	....	67.876	12.773	3.014	2.015	....	....	....	52.026
	....	7.787	.006	....	....	....	....	....	5.416
	....	75.663	12.779	3.014	2.015	....	....	....	57.442
Total..........	107.250	2687.589	212.378	41.621	960.529	110.363	....	52.877	1570.230
	39.870	801.033	89.262	.808	286.620	22.758	.104	23.934	487.705
	147.120	3488.622	301.640	42.429	1247.149	133.121	.104	76.811	2057.935

Grand Total...	Total miles applied for to July 1, 1914	4,119.730
	Total miles applied for during 1915 fiscal year	1,240.455
	Total miles applied for to June 30, 1915	5,360.185

	Single reward.	Trunk line.	Total.
Total reward paid to July 1, 1914	$1,628,485	$117,643	$1,746,128
Total reward paid during 1915 fiscal year	583,895	199,671	783,566
Total reward paid to June 30, 1915	$2,212,380	$317,314	$2,529,694

Note: *Includes payments made to Good Roads Districts.
Minus (—) in application column indicates cancellation.
Minus (—) in built column indicates rebuilt under some other class.

CONCLUDED.

{ Line one, total to July 1, 1914.
Line two, current year business.
Line three, total June 30, 1915.

by classes.					Reward paid in dollars.			
Built.					Single reward.		Trunk line.	
C.	D.*	E.	F.	G.	County districts.	Township.	County.	Township.
8.034 2.877 10.911	....	9.984 −1.092 8.892	64.401 26.352 90.753	.... .104 .104	$90,953 40,824 131,777	$4,587 1,110 5,697	$26,196 7,224 33,420	....
5.636 3.862 9.498	3.014 .... 3.014	2.015 .... 2.015	....	....	9,414 2,933 12,347	25,101 3,538 28,639	.... 2,113 2,113	$747 2,223 2,970
77.867 63.749 141.616	22.843 9.045 31.888	647.379 141.841 789.220	66.892 31.900 98.792	.... .104 .104	$766,290 364,998 *1,131,288	$862,195 218,897 1,081,092	$104,177 143,011 247,188	$13,466 56,660 70,126

Total miles built to July 1, 1914	2,437.588
Total miles built during 1915 fiscal year	758.778
Total miles built to June 30, 1915	3,196.366

TABLE NO. 13.—*Summary by counties for*

Note three lines to each county.

County.	Length in miles								
	Applications.							Built.	
	A.	B.	C.	D.	E.	F.	G.	A.	B.
Alger.........	....	....	....	....	20.526	....	....	....	....
	1.250	1.000	....	....	3.141	....	....	1.250	....
	1.250	1.000	....	....	23.667	....	....	1.250	....
Allegan.......	.800	16.031	3.503	....	10.969	....	....	.800	3.546
	....	14.281	−1.000	....	8.714	....	....	....	6.814
	.800	30.312	2.503	....	19.683	....	....	.800	10.360
Alpena........	....	....	....	....	3.042	....	....	....	....
	....	....	....	....	....	....	....	....	....
	....	....	....	....	3.042	....	....	....	....
Antrim........	....	72.045	1.004	5.287	....	....	....	....	50.171
	....	7.046	....	....	....	....	....	....	8.994
	....	79.091	1.004	5.287	....	....	....	....	59.165
Arenac........	....	9.269	....						2.023
	....	.364	3.350	....	....	....	....	....	....
	....	9.633	3.350	....	....	....	....	....	2.023
Barry.........	....	46.830	....	....	....	....	....	....	40.890
	....	6.150	....	....	....	....	....	....	1.064
	....	52.980	....	....	....	....	....	....	41.954
Bay..........	2.207	10.890	11.057	....	74.259	1.161	....	....	4.736
	−1.210	.584	7.416	....	.344	.500	....	....	....
	.997	11.474	18.473	....	74.603	1.661	....	....	4.736
Benzie........	1.502	94.250	....	....	.748	....	....	1.502	56.453
	1.124	5.853	....	....	....	....	....	....	7.630
	2.626	100.103	....	....	.748	....	....	1.502	64.083
Berrien........	.250	6.536	1.000	2.375	124.622	1.169	....	.250	4.141
	....	−1.750	....	....	40.739	−.280	....	....	.502
	.250	4.786	1.000	2.375	165.361	.889	....	.250	4.643
Branch........	....	54.198	1.506	....	....	....	....	....	34.249
	....	7.695	2.933	....	2.341	1.698	....	....	4.112
	....	61.893	4.439	....	2.341	1.698	....	....	38.361
Calhoun.......	....	147.763	10.921	....	12.990	....	....	....	101.780
	....	9.419	10.334	....	1.319	....	....	....	16.543
	....	157.182	21.255	....	14.309	....	....	....	118.323
Cass..........	....	57.328	4.007	....	....	....	....	....	39.562
	....	18.821	2.071	....	....	....	....	....	9.000
	....	76.149	6.078	....	....	....	....	....	48.562
Charlevoix.....	....	19.894	.994	....	11.269	....	....	....	9.447
	.480	4.913	.264	....	6.612	....	....	....	7.307
	.480	20.807	1.258	....	17.881	....	....	....	16.754
Cheboygan....	....	10.621	2.630	1.515	42.811	....	....	....	3.576
	....	.502	....	....	8.342	....	....	....	.502
	....	11.123	2.630	1.515	51.153	....	....	....	4.078
Chippewa.....	....	....	....	....	21.508	....	....	....	....
	....	....	10.000	....	59.545	2.300	....	....	....
	....	....	10.000	....	81.053	2.300	....	....	....
Clare.........	1.494	38.648	.999	....	....	....	....	1.000	20.737
	....	14.928	2.985	....	.999	....	....	....	8.502
	1.494	53.576	3.984	....	.999	....	....	1.000	29.239

Mixing and placing concrete on the Lansing and East Lansing Road, Ingham county.

fiscal year ending June 30, 1916.

Line one, total to July 1, 1915.
Line two, current year business.
Line three, total June 30, 1916.

by classes.					Reward paid in dollars.			
Built.					Single reward.		Trunk line.	
C.	D.	E.	F.	G.	County districts.	Township.	County.	Township.
...	...	11.051	...	...	$16,577	...	...	...
...	...	5.053	...	...	8,049	...	$6,830	...
...	...	16.104	...	...	24,626	...	6,830	...
2.503	...	4.608	...	...	1,538	$7,088	...	...
...	...	1.732	...	...	5,444	...	...	...
2.503	...	6 340	...	...	6,982	7,088	...	...
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...
1.004	5.287	...	...	...	...	30,723	...	$3,376
...	...	...	...	...	...	5,488	...	2,971
1.004	5.287	...	...	...	...	36,211	...	6,347
...	...	...	...	...	...	1,163	...	...
2.250	...	...	...	...	...	1,688	...	...
2.250	...	...	...	...	...	2,851	...	...
...	...	...	...	...	...	21,585	...	2,768
...	...	...	...	...	...	532	...	...
...	...	...	...	...	...	22,117	...	2,768
1.445	...	61.180	1.161	...	65,295	1,248	8,570	...
2.553	...	4.472	.500	...	7,237	...	1,850	...
3.998	...	65.652	1.661	...	72,532	1,248	10,420	...
...	...	.748	...	...	...	31,117	...	5,974
...	...	...	...	...	...	4,573	...	1,850
...	...	.748	...	...	...	35,690	...	7,824
1.000	2.375	63.055	.889	...	52,207	28,154	4,469	4,150
...	...	10.798	...	...	11,507	4,378	3,301	566
1.000	2.375	73.853	.889	...	63,714	32,532	7,770	4,716
...	...	...		...	10,339	7,444	...	...
1.506	...	1.042	...	...	5,747	...	3,691	...
1.506	...	1.042	...	...	16,086	7,444	3,691	...
1.660	...	11.236	...	...	27,717	39,149	7,051	...
12.065	...	...	...	...	17,678	1,967	4,255	...
13.725	...	11.236	...	...	45,395	41,116	11,306	...
2.075	...	...	...	...	6,000	15,337	...	...
...	...	...	...	...	4,250	250	...	...
2.075	...	...	...	...	10,250	15,587	...	...
...	...	8.773	...	...	12,342	1,746	1,576	...
.606	...	2.223	...	...	7,292	...	2,561	...
.606	...	10.996	...	...	19,634	1,746	4,137	...
2.630	1.515	13.647	...	...	19,367	...	...	...
...	...	7.688	...	...	10,312	...	8,921	...
2.630	1.515	21.335	...	...	29,679	...	8,921	...
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	11,408	...	3,487
...	...	...	...	...	...	4,889	...	2,514
...	...	...	...	...	...	16,297	...	6,001

TABLE NO. 13.—

Note three lines to each county.

County.	Length in miles								
	Applications.							Built.	
	A.	B.	C.	D.	E.	F.	G.	A.	B.
Clinton.......	....	30.859	6.706	....	....	....	....	....	4.212
	.792	8.946	−.934	....	....	....	....	....	9.752
	.792	39.805	5.772	....	....	....	....	....	13.964
Crawford......	4.980	11.952	6.672	....	2.042	....	....	4.980	10.938
	3.116	1.109	....	....	.828	....	....	....	1.014
	8.096	13.061	6.672	....	2.870	....	....	4.980	11.952
Delta.........	....	....	....	....	99.169	....	....	....	....
	....	....	....	....	8.409	....	....	....	....
	....	....	....	....	107.578	....	....	....	....
Dickinson.....	5.000	.315	....	....	15.576	....	....	....	....
	3.712	....	2.081	....	.270	....	....	5.000	.315
	8.712	.315	2.081	....	15.846	....	....	5.000	.315
Eaton.........	....	116.109	....	....		....	....	....	79.879
	.972	34.172	.500	....	....	....	....	....	12.934
	.972	150.281	.500	....	....	....	....	....	92.813
Emmet........	....	18.109	....	.142	14.883	....	....	....	14.244
	....	5.214	....	....	4.034	....	....	....	1.732
	....	23.323	....	.142	18.917	....	....	....	15.976
Genesee.......	.678	211.462	17.377	12.227	13.085	....	....	.678	123.012
	....	7.526	1.496	−1.833	1.833	....	....	....	26.700
	.678	218.988	18.873	10.394	14.918	....	....	.678	149.712
Gladwin.......	24.513	1.004	....	....	....	....	....	....	1.004
	1.412	1.994	....	....	....	....	....	....	....
	25.925	2.998	....	....	....	....	....	....	1.004
Gogebic.......	....	13.368	....	....	3.060	....	....	....	3.578
	....	−3.148	....	....	....	....	....	....	....
	....	10.220	....	....	3.060	....	....	....	3.578
Grand Traverse	.920	71.602	.170	4.611	1.512	....	....	.920	48.831
	....	10.701	....	....	4.238	....	....	....	6.623
	.920	82.303	.170	4.611	5.750	....	....	.920	55.454
Gratiot........	34.443	136.586	....	....	....	....	....	22.185	112.460
	−3.402	1.628	....	1.769	....	....	....	4.866	3.524
	31.041	138.214	....	1.769	....	....	....	27.051	115.984
Hillsdale......	....	42.074	....	....	14.230	....	....	....	28.022
	....	....	....	....	17.057	....	....	....	7.112
	....	42.074	....	....	31.287	....	....	....	35.134
Houghton.....	....	.890	2.220	....	21.739	....	....	....	.890
	....	....	....	....	1.338	....	....	....	....
	....	.890	2.220	....	23.077	....	....	....	.890
Huron........	3.690	92.057	4.936	....	35.304	7.068	....	3.690	62.359
	2.000	27.316	2.000	....	2.001	....	....	....	24.420
	5.690	119.373	6.936	....	37.305	7.068	....	3.690	86.779
Ingham.......	.500	64.378	4.594	....	2.069	....	....	.500	26.954
	1.000	17.143	1.887	....	−.750	....	....	....	13.443
	1.500	81.521	6.481	....	1.319	....	....	.500	40.397
Ionia.........	....	62.597	....	....	....	....	....	....	37.266
	1.252	25.177	....	....	....	.654	....	....	11.798
	1.252	87.774	....	....	....	.654	....	....	49.064

CONTINUED.

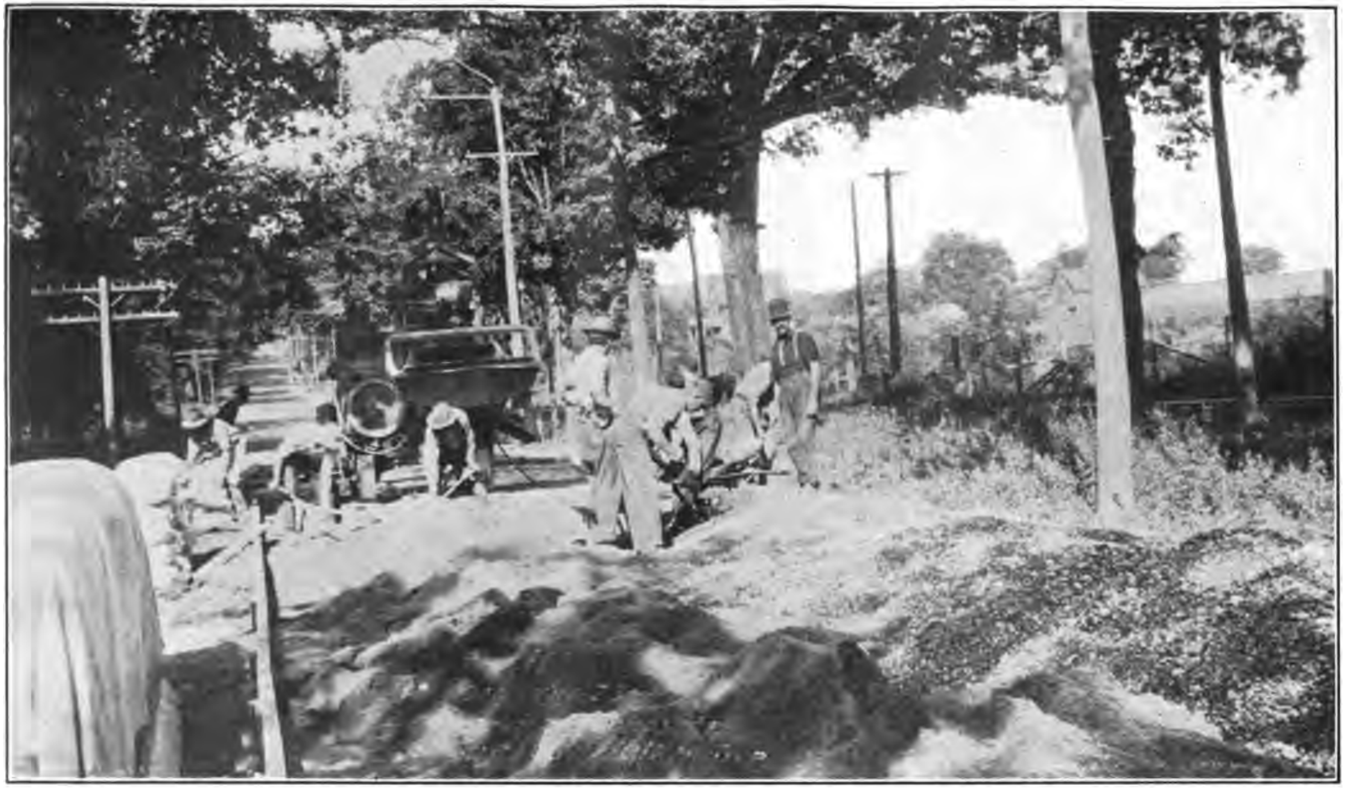
Line one, total to July 1, 1915.
Line two, current year business.
Line three, total June 30, 1916.

by classes.					Reward paid in dollars.			
Built.					Single reward.		Trunk line.	
C.	D.	E.	F.	G.	County districts.	Township.	County.	Township.
.663	....	....	....	....	$1,098	$1,505	....	....
1.756	....	....	....	....	6,119	250	$425	....
2.419	....	....	....	....	7,217	1,755	425	....
4.294	....	1.000	....	....	....	10,934	....	....
....	....	....	....	....	....	507	....	....
4.294	....	1.000	....	....	....	11,441	....	....
....	....	52.216	....	....	45,489	13,808	16,062	....
....	....	9.002	....	....	17,834	2,372	25,876	....
....	....	61.218	....	....	63,323	16,180	41,938	....
....	....	15.576	....	....	12,796	2,780	5,421	....
2.081	....	−2.081	....	....	2,071	....	3,095	....
2.081	....	13.495	....	....	14,867	2,780	8,516	....
....	....	....	....	....	11,908	28,382	....	....
....	....	....	....	....	6,151	1,409	....	....
....	....	....	....	....	18,059	29,791	....	....
....	.142	12.423	....	....	20,867	....	6,238	....
....	....	2.460	....	....	4,594	....	3,284	....
....	.142	14.883	....	....	25,461	....	9,522	....
15.455	10.394	13.085	....	....	81,364	14,156	5,398	....
.995	....	....	....	....	11,560	2,536	....	....
16.450	10.394	13.085	....	....	92,924	16,692	5,398	....
....	....	....	....	....	502	....	....	....
....	....	....	....	....	....	....	....	....
....	....	....	....	....	502	....	....	....
....	....	3.060	....	....	4,849	....	1,530	....
....	....	....	....	....	....	....	....	....
....	....	3.060	....	....	4,849	....	1,530	....
.170	.811	....	....	....	13,618	17,420	8,609	251
....	.994	.511	....	....	1,842	3,961	1,508	186
.170	1.805	.511	....	....	15,460	21,381	10,117	437
....	....	....	....	....	....	62,133	....	3,372
....	....	....	....	....	....	2,977	....	....
....	....	....	....	....	....	65,110	....	3,372
....	....	9.729	....	....	....	24,137	....	....
....	....	7.893	....	....	....	12,324	....	2,697
....	....	17.622	....	....	....	36,461	....	2,697
2.220	....	18.208	....	....	28,506	....	21,795	....
....	....	4.202	....	....	7,429	....	7,960	....
2.220	....	22.410	....	....	35,935	....	29,755	....
4.436	....	33.683	2.068	....	....	72,830	....	4,402
1.000	....	1.132	....	....	....	14,735	....	1,600
5.436	....	34.815	2.068	....	....	87,565	....	6,002
4.594	....	.814	....	....	3,937	14,528	1,425	....
....	....	....	....	....	6,807	1,687	4,849	....
4.594	....	.814	....	....	10,744	16,215	6,274	....
....	....	....	....	....	....	18,983	....	1,289
....	....	....	....	....	....	8,213	....	5,398
....	....	....	....	....	....	27,196	....	6,687

TABLE NO. 13.—

Note three lines to each county.

County.	Length in miles								
	Applications.							Built.	
	A.	B.	C.	D.	E.	F.	G.	A.	B.
Iosco	9.056	11.681			5.364			5.496	1.500
	4.672	−2.392						3.028	3.525
	13.728	9.289			5.364			8.524	5.025
Iron		37.770	12.558		7.062				5.416
		−2.145	1.204		5.083				5.084
		35.625	13.762		12.145				10.500
Isabella		83.654	2.024						56.800
		7.952							7.016
		91.606	2.024						63.816
Jackson	2.188	69.085	7.074		4.500			2.188	44.669
		39.985							20.544
	2.188	109.070	7.074		4.500			2.188	65.213
Kalamazoo	2.740	92.837	.500	1.000	23.791	1.176		2.740	78.678
	1.536	7.469			−.527	2.147			6.656
	4.276	100.306	.500	1.000	23.264	3.323		2.740	85.334
Kalkaska	3.408	38.639		1.994	6.786			3.408	32.591
	.388	5.042	.500		.781			.388	4.345
	3.796	43.681	.500	1.994	7.567			3.796	36.936
Kent		105.421	10.508		7.510	1.028			59.634
		28.686	.066		2.995	3.281			24.901
		134.107	10.574		10.505	4.309			84.535
Keweenaw					5.590				
					4.500	1.000			
					10.090	1.000			
Lake		18.927							10.370
		4.726							1.040
		23.653							11.410
Lapeer	4.272	38.301	7.009					1.004	27.237
	7.836	4.604	1.495					2.520	9.048
	12.108	42.905	8.504					3.524	36.285
Leelanau		22.656							9.748
		−1.052		6.167					7.802
		21.604		6.167					17.550
Lenawee	1.010	1.270	1.022		23.887			1.010	
	2.036	11.810	2.554		35.207				
	3.046	13.080	3.576		59.094			1.010	
Livingston		79.166	5.000						46.683
		29.620	.304						17.386
		108.786	5.304						64.069
Luce			8.422	.999	2.708				
		.114	3.886		21.926				.114
		.114	12.308	.999	24.634				.114
Mackinac		7.750			7.992				
	4.020	9.054			11.011				
	4.020	16.804			19.003				
Macomb		4.634	27.391		5.056				3.074
		−1.324	10.440		2.229				.236
		3.310	37.831		7.285				3.310



Concrete mixer at work on the Leonard Street road, west out of Grand Rapids, Kent county. One of the first concrete jobs on the Wolverine Pavedway, outside of Wayne county.

CONTINUED.

Line one, total to July 1, 1915.
Line two, current year business.
Line three, total June 30, 1916.

by classes.					Reward paid in dollars.			
Built.					Single reward.		Trunk line.	
C.	D.	E.	F.	G.	County districts.	Township.	County.	Township.
....	....	5.364	....	....	$6,801	$912	$2,915	$246
....	....	....	....	....	1,989	909	980	659
....	....	5.364	....	....	8,790	1,821	3,895	905
4.474	....	7.062	....	....	16,080	4,338	13,969	....
.384	....	4.171	....	....	13,798	....	15,909	....
4.858	....	11.223	....	....	29,878	4,338	29,878	....
....	....	....	....	....	....	28,399	....	....
1.000	....	....	....	....	....	4,557	....	798
1.000	....	....	....	....	....	32,956	....	798
5.728	....	4.500	....	....	21,289	15,449	10,287	....
1.346	....	....	....	....	11,990	1,238	3,722	....
7.074	....	4.500	....	....	33,279	16,687	14,009	....
.500	1.000	15.635	1.176	....	61,628	390	9,555	....
....	....	1.815	....	....	4,897	1,249	1,202	....
.500	1.000	17.450	1.176	....	66,525	1,639	10,757	....
....	1.994	6.786	....	....	15,268	10,161	....	....
.500	....	.401	....	....	1,832	1,213	503	....
.500	1.994	7.187	....	....	17,100	11,374	503	....
....	....	2.997	1.028	....	18,659	16,861	2,175	....
4.044	....	....	....	....	18,122	1,781	5,156	....
4.044	....	2.997	1.028	....	*36,781	18,642	7,331	....
....	....	2.002	....	....	....	2,002	....	....
....	....	....	....	....	....	....	....	....
....	....	2.002	....	....	....	2,002	....	....
....	....	....	....	....	....	5,185	....	....
....	....	....	....	....	....	520	....	....
....	....	....	....	....	....	5,705	....	....
6.011	....		....	....	9,864	8,626	....	....
1.495	....	....	....	....	1,397	4,878	....	....
7.506	....	....	....	....	11,261	13,504	....	....
....	....	....	....	....	....	5,070	....	849
....	1.013	....	....	....	....	5,405	....	2,964
....	1.013	....	....	....	....	10,475	....	3,813
....	....	1.024	....	....	....	1,735	....	....
....	....	4.470	....	....	....	5,470	....	202
....	....	5.494	....	....	....	7,205	....	202
....	....	....	....	....	....	23,820	....	2,189
....	....	....	....	....	....	9,358	....	988
....	....	....	....	....	....	33,178	....	3,177
....	.999	....	....	....	750	....	....	....
1.652	....	3.712	....	....	5,204	1,506	....	....
1.652	.999	3.712	....	....	5,954	1,506	....	....
....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....
13.995	....	3.752	....	....	19,836	2,537	6,370	....
7.989	....	1.304	....	....	11,745	....	1,299	....
21.984	....	5.056	....	....	31,581	2,537	7,669	....

TABLE NO. 13.—

Note three lines to each county.

County.	Length in miles								
	Applications.							Built.	
	A.	B.	C.	D.	E.	F.	G.	A.	B.
Manistee......	1.120	95.248	....	1.023	4.321	....	....	1.120	58.301
	....	19.019	.250	....	1.020	....	....	....	7.194
	1.120	114.267	.250	1.023	5.341	....	....	1.120	65.495
Marquette.....	1.213	....	5.028	....	18.936	....	....	....	....
	24.933	....	−1.500	....	....	....	....	....	....
	26.146	....	3.528	....	18.936	....	....	....	....
Mason.........	1.992	107.109	....	.500	21.156	....	....	1.500	46.351
	....	18.672	....	....	−1.839	....	....	....	7.658
	1.992	125.781	....	.500	19.317	....	....	1.500	54.009
Mecosta.......	....	86.822	....	....	....	....	....	....	70.320
	....	41.158	....	....	....	....	....	....	5.890
	....	127.980	....	....	....	....	....	....	76.210
Menominee....	1.002	33.474	28.976	4.908	10.657	....	....	1.002	19.488
	....	18.714	3.962	−2.969	.954	....	....	....	11.434
	1.002	52.188	32.938	1.939	11.611	....	....	1.002	30.922
Midland.......	9.655	13.596	6.514	....	24.051	....	....	1.000	5.460
	7.459	10.734	2.000	....	.163	....	....	3.643	2.716
	17.114	24.330	8.514	....	24.214	....	....	4.643	8.176
Missaukee.....	....	34.849	11.043	.171	2.825	....	....	....	21.526
	....	13.980	....	....	....	....	....	....	4.028
	....	48.829	11.043	.171	2.825	....	....	....	25.554
Monroe.......	....	.092	3.106	....	66.690	....	....	....	....
	....	−.092	−1.102	....	72.254	29.842	....	....	....
	....	....	2.004	....	138.944	29.842	....	....	....
Montcalm.....	4.097	100.061	....	....	....	....	....	3.089	74.548
	....	17.913	....	....	....	....	....	....	8.279
	4.097	117.974	....	....	....	....	....	3.089	82.827
Muskegon.....	3.794	24.459	1.277	....	47.236	....	....	3.034	19.017
	....	1.436	....	....	15.231	....	....	.500	....
	3.794	25.895	1.277	....	62.467	....	....	3.534	19.017
Newaygo......	....	70.550	.307	....	8.745	....	....	....	38.622
	....	26.924	....	....	....	....	....	....	7.991
	....	97.474	.307	....	8.745	....	....	....	46.613
Oakland.......	....	70.485	22.107	2.107	3.490	4.333	....	....	32.867
	....	26.098	3.785	....	....	....	....	....	8.730
	....	96.583	25.892	2.107	3.490	4.333	....	....	41.597
Oceana........	1.489	25.291	....	....	62.905	....	....	....	15.052
	....	12.019	3.485	....	−1.147	....	....	....	.999
	1.489	37.310	3.485	....	61.758	....	....	....	16.051
Ogemaw.......	....	37.648	1.743	....	.246	....	....	....	8.551
	....	7.166	....	....	....	....	....	....	5.520
	....	44.814	1.743	....	.246	....	....	....	14.071
Ontonagon....	4.000	....	....	....	9.550	....	....	4.000	....
	....	14.432	6.664	....	.985	....	....	....	....
	4.000	14.432	6.664	....	10.535	....	....	4.000	....
Osceola.......	....	58.121	3.885	.556	5.474	....	....	....	29.775
	....	5.494	3.171	....	1.012	....	....	....	5.107
	....	63.615	7.056	.556	6.486	....	....	....	34.882

CONTINUED.

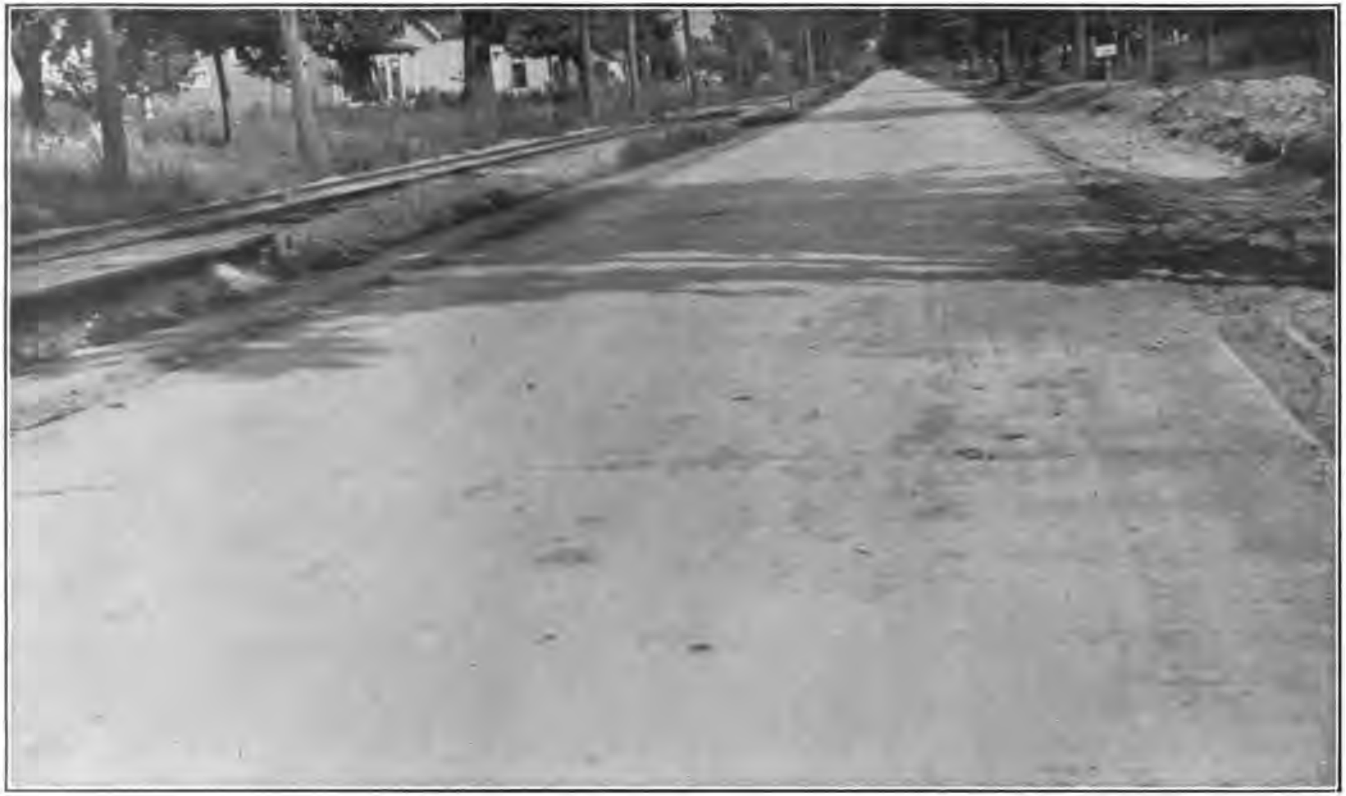
Line one, total to July 1, 1915.
Line two, current year business.
Line three, total June 30, 1916.

by classes.					Reward paid in dollars.			
Built.					Single reward.		Trunk line.	
C.	D.	E.	F.	G.	County districts.	Township.	County.	Township.
...	1.023	4.318	...	...	$26,607	$9,898	$5,912	...
.250	...	1.020	...	...	5,601	740	2,053	...
.250	1.023	5.338	...	...	32,208	10,638	7,965	...
1.924	...	14.467	...	...	15,159	2,834	8,904	...
1.604	...	...	...	...	1,805	...	1,805	...
3.528	...	14.467	...	...	16,964	2,834	10,709	...
...	.500	13.972	...	...	30,874	7,023	700	...
...	...	...	...	...	750	3,079	...	...
...	.500	13.972	...	...	31,624	10,102	700	...
...	...	...	...	...	14,566	21,187	2,080	...
...	...	...	...	...	850	2,095	...	...
...	...	...	...	...	15,416	23,282	2,080	...
14.858	...	8.393	...	...	27,432	6,155	9,850	...
5.012	...	.954	...	...	8,014	5,717	2,264	...
19.870	...	9.347	...	...	35,446	11,872	12,114	...
3.486	...	5.976	...	...	1,862	9,709	...	$2,972
...	...	3.461	...	...	3,997	1,732	3,461	...
3.486	...	9.437	...	...	*5,859	11,441	3,461	2,972
10.253	.171	1.935	...	...	7,393	13,124	...	...
...	...	...	...	...	1,012	1,152	...	...
10.253	.171	1.935	...	...	8,405	14,276	...	...
1.000	...	36.383	...	...	825	42,283	...	...
1.004	...	3.482	...	...	3,191	3,178	...	1,280
2.004	...	39.865	...	...	4,016	45,461	...	1,280
...	...	...	...	...	...	38,124	...	...
...	...	...	...	...	...	4,139	...	...
...	...	...	...	...	...	42,263	...	...
.931	...	43.184	...	...	49,120	6,555	16,556	...
...	...	4.184	...	...	4,545	400	1,545	...
.931	...	47.368	...	...	53,665	6,955	18,101	...
.307	...	8.745	...	...	...	29,246	...	4,646
...	...	...	...	...	...	4,090	...	...
.307	...	8.745	...	...	...	33,336	...	4,646
3.004	2.107	2.004	.123	...	6,718	18,325	2,625	3,524
11.003	...	1.486	4.210	...	22,790	1,486	10,550	...
14.007	2.107	3.490	4.333	...	29,508	19,811	13,175	3,524
...	...	51.416	...	...	...	61,192	...	1,990
...	...	6.386	...	...	...	6,665	...	3,290
...	...	57.802	...	...	...	67,857	...	5,280
...	...	...	...	...	4,424	...	645	...
1.743	...	.246	...	...	4,780	...	2,020	...
1.743	...	.246	...	...	9,204	...	2,665	...
...	...	8.566	...	...	2,000	7,566	...	5,000
...	...	.984	...	...	984	...	...	...
...	...	9.550	...	...	2,984	7,566	...	5,000
1.126	.556	5.474	...	...	...	21,623	...	375
.988	...	1.012	...	...	...	5,079	...	1,255
2.114	.556	6.486	...	...	...	26,702	...	1,630

TABLE NO. 13.—

Note three lines to each county.

County.	Length in miles								
	Applications.							Built.	
	A.	B.	C.	D.	E.	F.	G.	A.	B.
Oscoda	1.000	....	....	....	....	....	....	....	....
	....	....	....	....	....	....	....	....	....
	1.000	....	....	....	....	....	....	....	....
Otsego	....	....	....	....	....	....	....	....	....
	....	6.075	.733	....	1.046	....	....	....	....
	....	6.075	.733	....	1.046	....	....	....	....
Ottawa	....	149.180	2.008	....	3.262	.500	....	....	13.955
	4.958	−1.682	....	....	....	2.171	....	....	22.666
	4.958	147.498	2.008	....	3.262	2.671	....	....	36.621
Presque Isle	....	3.890	....	....	....	....	....	....	3.890
	....	6.478	1.008	....	....	....	....	....	2.992
	....	10.368	1.008	....	....	....	....	....	6.882
Roscommon	....	4.490	....	....	....	....	....	....	4.490
	....	....	....	....	....	....	....	....	....
	....	4.490	....	....	....	....	....	....	4.490
Saginaw	2.032	27.418	1.522	....	185.089	1.088	....	2.032	6.321
	....	7.487	4.231	....	11.882	....	....	....	4.708
	2.032	34.905	5.753	....	196.971	1.088	....	2.032	11.029
Sanilac	....	58.111	....	....	14.507	....	....	....	24.439
	....	4.034	1.004	....	3.095	....	....	....	12.422
	....	62.145	1.004	....	17.602	....	....	....	36.861
Schoolcraft	....	6.500	....	....	19.510	....	....	....	....
	....	−6.500	....	....	13.055	....	....	....	....
	....	....	....	....	32.565	....	....	....	....
Shiawassee	3.880	115.352	....	....	....	....	....	3.384	53.944
	1.008	17.584	....	....	....	....	....	....	21.463
	4.888	132.936	....	....	....	....	....	3.384	75.407
St. Clair	2.304	18.134	....	....	40.029	.506	....	....	4.754
	....	....	.998	....	.195	....	....	.746	1.134
	2.304	18.134	.998	....	40.224	.506	....	.746	5.888
St. Joseph	3.596	28.477	2.582	....	7.212	....	....	2.004	12.256
	4.415	3.752	.312	....	−1.043	....	....	3.999	5.319
	8.011	32.229	2.894	....	6.169	....	....	6.003	17.575
Tuscola	....	112.852	11.238	....	14.343	....	....	....	86.252
	1.536	40.394	.992	....	....	....	....	....	22.508
	1.536	153.246	12.230	....	14.343	....	....	....	108.760
Van Buren	2.295	25.277	8.513	....	20.349	....	....	2.295	20.053
	....	2.078	−.984	1.000	−.216	....	....	....	2.816
	2.295	27.355	7.529	1.000	20.133	....	....	2.295	22.869
Washtenaw	....	22.148	3.088	....	....	....	....	....	15.781
	....	12.164	....	....	....	....	....	....	5.725
	....	34.312	3.088	....	....	....	....	....	21.506



Finished concrete surface on a level park road west of Battle Creek. One of the first pieces of concrete to be laid on the Detroit-Chicago road.

CONTINUED.

Line one, total to July 1, 1915.
Line two, current year business.
Line three, total June 30, 1916.

by classes.					Reward paid in dollars.			
Built.					Single reward.		Trunk line.	
C.	D.	E.	F.	G.	County districts.	Township.	County.	Township.
....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....
....	....	1.000	....	....	$7,489	$2,541	$2,453	....
....	....	.508	....	....	12,740	....	....	....
....	....	1.508	....	....	20,229	2,541	2,453	....
....	....	....	....	....	....	2,598	....	....
....	....	....	....	....	....	1,846	....	$1,299
....	....	....	....	....	....	4,444	....	1,299
....	....	....	....	....	....	2,245	....	....
....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	2,245	....	....
1.522	....	129.638	1.088	....	132,044	4,235	8,092	....
....	....	28.404	....	....	33,890	....	5,941	....
1.522	....	158.042	1.088	....	165,934	4,235	14,033	....
....	....	10.002	....	....	....	23,721	....	4,000
1.004	....	3.558	....	....	....	12,172	....	2,400
1.004	....	13.560	....	....	....	35,893	....	6,400
....	....	11.990	....	....	12,819	....	5,113	....
....	....	3.020	....	....	3,020	....	....	....
....	....	15.010	....	....	15,839	....	5,113	....
....	....	....	....	....	14,159	15,118	3,354	....
....	....	....	....	....	8,488	3,158	2,221	....
....	....	....	....	....	22,647	18,276	5,575	....
....	....	21.688	.506	....	5,617	21,635	9,310	....
....	....	2.509	....	....	6,618	187	98	....
....	....	24.197	.506	....	12,235	21,822	9,408	....
1.894	....	1.970	....	....	8,538	1,877	535	....
....	....	1.004	....	....	4,654	....	584	....
1.894	....	2.974	....	....	13,192	1,877	1,119	....
2.999	....	3.750	....	....	2,812	48,713	....	5,423
1.004	....	4.636	....	....	....	18,405	....	2,186
4.003	....	8.386	....	....	*2,812	67,118	....	7,609
1.000	....	10.228	....	....	....	24,347	....	6,873
2.698	1.000	2.964	....	....	....	10,225	....	2,786
3.698	1.000	13.192	....	....	....	34,572	....	9,659
2.046	....	....	....	....	10,215	1,639	2,111	....
....	....	....	....	....	2,971	284	953	....
2.046	....	....	....	....	*13,186	1,923	3,064	....

TABLE NO. 13.—

Note three lines to each county.

County.	Length in miles								
	Applications.							Built.	
	A.	B.	C.	D.	E.	F.	G.	A.	B.
Wayne	....	13.869	14.120	....	8.892	115.092	.104	....	13.120
	....	....	....	....	3.129	29.258	....	....	.122
	....	13.869	14.120	....	12.021	144.350	.104	....	13.242
Wexford	....	75.663	12.779	3.014	2.015	....	....	....	57.442
	....	10.570	2.968	....	....	4.601	....	....	4.594
	....	86.233	15.747	3.014	2.015	4.601	....	....	62.036
Total	147.120	3,488.622	301.640	42.429	1,247.149	133.121	.104	76.811	2,057.935
	77.295	705.834	99.578	2.365	374.335	77.172	....	25.940	480.049
	224.415	4,194.456	401.218	44.794	1,621.484	210.293	.104	102.751	2,537.984

Grand Total...	Total miles applied for to July 1, 1915	5,360.185
	Total miles applied for during 1916 fiscal year	1,336.579
	Total miles applied for to June 30, 1916	6,696.764

	Single reward.	Trunk line.	Total.
Total reward paid to July 1, 1915	$2,212,380	$317,314	$2,529,694
Total reward paid during 1916 fiscal year	576,726	180,806	757,532
Total reward paid to June 30, 1916	2,789,106	498,120	3,287,226

Note: *Includes payments made to Good Roads Districts.
Minus (—) in application column indicates cancellation.
Minus (—) in built column indicates rebuilt under some other class.

CONCLUDED.

{ Line one, total to July 1, 1915.
Line two, current year business.
Line three, total June 30, 1916.

by classes.					Reward paid in dollars.			
Built.					Single reward.		Trunk line.	
C.	D.	E.	F.	G.	County districts.	Township.	County.	Township.
10.911	....	8.892	90.753	.104	$131,777	$5,697	$33,420	....
1.000	....	−2.932	20.538	....	30,123	975	1,657	....
11.911	....	5.960	111.291	.104	161,900	6,672	35,077	....
9.498	3.014	2.015	....	....	12,347	28,639	2,113	$2,970
.932	....	....	....	....	781	2,601	....	588
10.430	3.014	2.015	....	....	13,128	31,240	2,113	3,558
141.616	31.888	789.220	98.792	.104	*$1,131,288	$1,081,092	$247,188	$70,126
71.464	3.007	138.886	25.248	....	374,501	202,225	142,329	38,477
213.080	34.895	928.106	124.040	.104	*1,505,789	1,283,317	389,517	108,603

Total miles built to July 1, 1915	3,196.366
Total miles built during 1916 fiscal year	744.594
Total miles built to June 30, 1916	3,940.960

During the 1916 fiscal year 348¼ miles of road were accepted on which the reward could not be paid until after July 1, 1916, because of the lack of funds.

TABLE NO. 14.—*State*

Contract.	Crossing.	County.	Township.	Type.	Span in feet.
2	Chovin Creek	Wayne	Springwells	I-Beam	2 at 24
3	Plaster Creek	Kent	Wyoming	Concrete arch	50
4	Shiawassee River	Shiawassee	Rush	Concrete arch	2 at 80
5	Rush Creek	Ottawa	Georgetown	Plate girder	55
6	Rush Creek	Ottawa	Georgetown	I-Beam	40
7	Red Cedar River	Ingham	Meridian	Concrete girder	2 at 41
8	Pike River	Houghton	Chassell	I-Beam	38
9	Snake River	Houghton	Chassell	I-Beam	38
10	Carp River	Emmet	Carp Lake	I-Beam	36
11	River Rouge	Wayne	Redford	Plate girder	82
12	Bowen Creek	Manistee	Arcadia	I-Beam	34
13a	Tittabawassee River	Midland	Jerome	I-Beam approaches	2 at 38
14	Fortune Lake	Iron	Crystal Falls	I-Beam	38
15	Black River	Gogebic	Wakefield	I-Beam	42
16b	White Fish River	Delta	Masonville	Pony truss	2 at 80
17	Scotts Creek	Alger	Mathias	Concrete arch	40
18	Duck Creek	Gogebic	Watersmeet	I-Beam	38
19	Pentwater River	Oceana	Weare	Pony truss	70
20c	Sink Hole	Newaygo	Sherman		
21	Hickory Creek	Berrien	St. Joseph	Pony truss	70
22	Michagamme River	Iron	Mansfield	Concrete arch	85
23	Sturgeon River	Midland	Midland	I-Beam	40
24	Sturgeon River	Houghton	Chassell	High truss	150
25	Pilgrim River	Houghton	Portage	Concrete arch	50
26	Cooks Run	Iron	Stambaugh	Concrete girder	50
27	Paint River	Iron	Stambaugh	Concrete girder	50
28	Tamarack River	Iron	Stambaugh	Concrete arch	50
29	Pine River	Mackinac	St. Ignace	Pony truss	2 at 85
30	Millecoquin River	Mackinac	Garfield	Pony truss	90
31	Silver Creek	Iosco	Wilbur	Skew I-Beam	32
32	Pine River	St. Clair	Kimball	High truss	105
37	Ford River	Delta	Wells	Pony truss	2 at 90
39	Au Gres River	Iosco	Reno	Plate girder	55
40	Pierson Creek	Muskegon	White River	Concrete girder	40
42	Salt River	Midland	Jerome	Pony truss	90
43	Sugar River	Gladwin	Gladwin	Pony truss	70
44	Pararie Creek	Ionia	Ionia	Concrete girder	40

Trunk Line Bridges.

Clear roadway in feet.	Contract awarded to—	Paid, 1914.	Paid, 1915.	Paid, 1916.	Estimated balance.	Total cost.
22	G. F. Bristol	$2,842 00				$4,055 00
	American Bridge Co	790 00				
	Wayne County Road Commissioners		$423 00			
36	Illinois Bridge Co	6,063 09				6,130 29
	Kent County Road Commissioners		67 20			
18	Illinois Bridge Co		11,272 07			11,272 07
18	Bad Axe Crushed Granite Co		2,130 15			3,531 48
	Central States Bridge Co		1,401 33			
20	Bad Axe Crushed Granite Co		1,240 60			1,482 20
	Jarvis Engine & Machine Works		241 60			
18	M. E. Fitzpatrick		4,461 08			4,461 08
20	Smith, Byers, Sparks & Co		2,005 20			2,266 64
	Jarvis Engine & Machine Works	261 44				
20	Smith, Byers, Sparks & Co		2,051 53			2,312 97
	Jarvis Engine & Machine Works	261 44				
20	Bad Axe Crushed Granite Co		1,215 75			1,445 43
	Jarvis Engine & Machine Works		229 68			
20	William J. Meagher		6,774 27			9,002 16
	American Bridge Co		2,227 89			
24	Small Bros. Bridge Co		2,174 88			3,016 15
	Jarvis Engine & Machine Works		212 16			
	Meredith Construction Co			$629 11		
18	E. C. Nolan		5,582 00			9,969 12
	Jarvis Engine & Machine Works		465 12			
	Central States Bridge Co		2,836 80	1,085 20		
20	D. F. Boyle		2,062 57			2,324 01
	Jarvis Engine & Machine Works		261 44			
20	Gaffin & Gehri		2,821 00			3,109 96
	Jarvis Engine & Machine Works		288 96			
18	Chas. E. Nevel		2,056 73	1,051 52		12,623 00
	Central States Bridge Co		3,937 37	150 00		
	Nebel Bros		2,600 00	1,300 00		
	Jarvis Engine & Machine Works			273 90		
	Nebel Bros			569 00		
	C. W. Davis			652 48		
	Jerry Madden Shingle Co		32 00			
18	Illinois Bridge Co		1,688 25			1,688 25
20	D. F. Boyle		2,249 00			2,510 44
	Jarvis Engine & Machine Works		261 44			
18	M. E. Fitzpatrick		3,459 04			5,000 13
	Cadillac Machine Co		1,541 09			
....	Bad Axe Crushed Granite Co		2,334 40			9,495 04
	Jarvis Engine & Machine Works		244 80			
	Derk Rottman			1,967 61		
	Meredith Construction Co			4,648 23		
	John Moulder			300 00		
20	Reed & Reed		2,223 88			4,322 61
	Elkhart Bridge & Iron Co		2,098 73			
18	McGrath & Sons Co		9,769 06			9,769 06
20	A. W. Baldwin		2,108 30			2,361 10
	Jarvis Engine & Machine Works		252 80			
18	Illinois Bridge Co			5,566 72		13,921 45
	Wisconsin Bridge & Iron Co				$6,943 49	
	Smith, Byers, Sparks & Co				111 24	
	Smith, Byers, Sparks & Co				1,300 00	
20	Meredith Construction Co			5,557 88		5,557 88
18	Counihan & Barnum			2,219 38		2,219 38
18	Gaffin & Gehri			2,102 00		2,102 00
18	Counihan & Barnum			2,826 10		2,826 10
18	Standish & Allen			11,946 68	628 77	12,575 45
18	Joliet Bridge & Iron Co			2,268 10		6,550 05
	D. F. Doyle & Co			4,281 95		
20	A. W. Baldwin			1,578 00		1,578 00
18	W. G. Jenks & R. M. Norton			5,641 25		5,641 25
18	Delta Contracting Co			4,096 00	6,916 86	11,012 86
18	A. W. Baldwin			2,431 80		3,806 45
	Cadillac Machine Co			1,374 65		
18	P. J. Connell Co			1,875 00		1,875 00
18	E. C. Nolan & Son			4,812 00		7,389 51
	Continental Bridge Co			2,577 51		
18	E. C. Nolan & Son			2,561 55		4,222 91
	American Bridge Co			1,661 36		
18	Meredith Construction Co			2,549 50		2,549 50

TABLE NO. 14.—

Contract.	Crossing.	County.	Township.	Type.	Span in feet.
45d	Eagle River	Keweenaw	Houghton	Deck Pratt truss	100
46	Teaspoon Creek	Luce	Pentland	Concrete girder	40
47e	Day's River	Delta	Brampton	Low truss	40
49*	Doan Creek	Ingham	Leroy	Concrete girder	50
50	Grand River	Kent	Ada	Pony truss	4 at 100
52	Pine River	St. Clair	Wales	Skew concrete girder	40
54	Eagle River	Keweenaw	Houghton	Skew plate girder	45
55*	Sage River	Luce	Pentland	Concrete girder	40
56	Rush Creek	Ottawa	Georgetown	Concrete girder	35
57	Paw Paw Creek	Berrien	Watervliet	Concrete arch	40
58f	Plaster Creek	Kent	Wyoming	Concrete arch	60
62*	Betsie River	Benzie	Benzonia	Concrete girder	40
65*	Hog Creek	Branch	Girard	Pony truss	75
70*	Little Tobacco River	Gladwin	Gladwin	Concrete girder	35

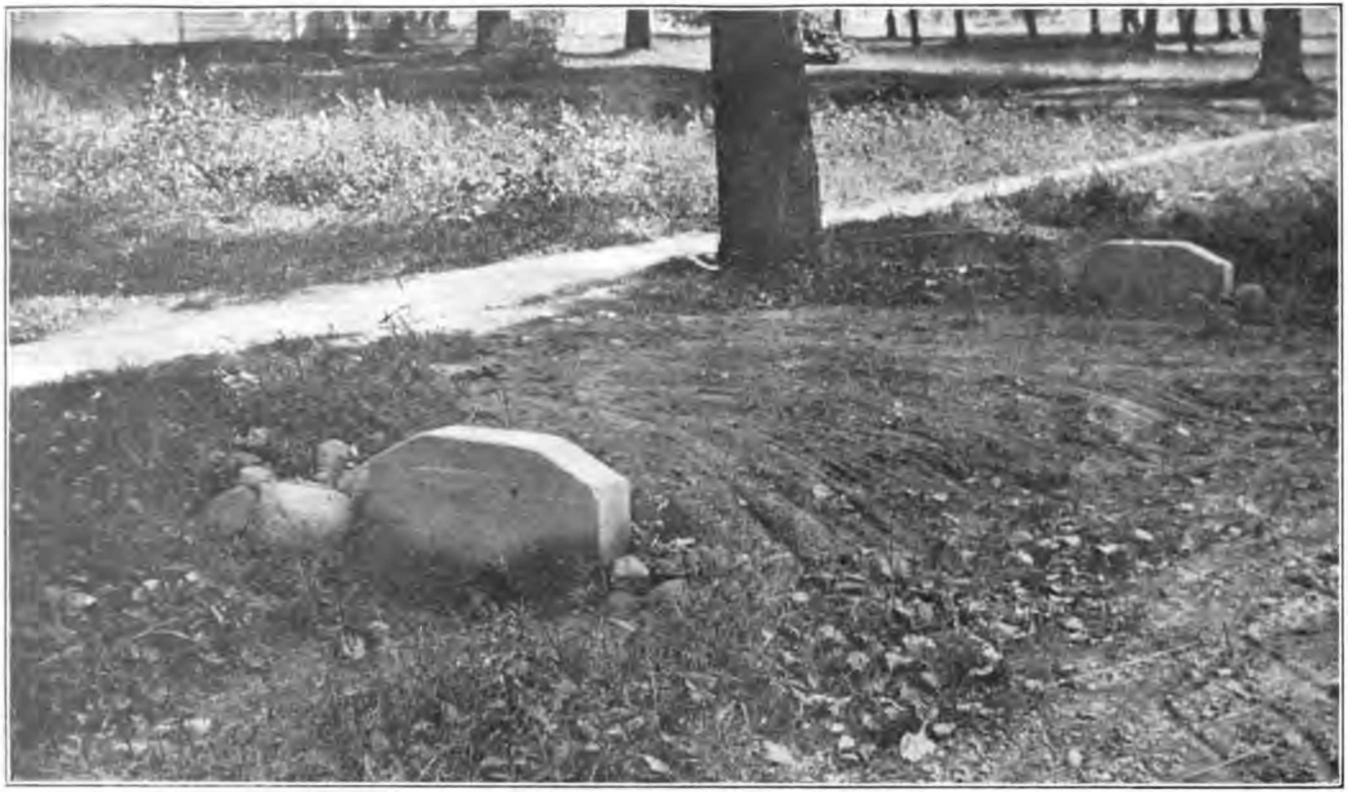
a Rebuilt bridge and added 2 I-Beam approaches at 38 ft.
b Added 2 80 ft. pony trusses, built new abutments and piers, and put in new floor.
c Bridge and fill.
d With I-Beam approaches at 20 ft.
e Built new floor.
f The Department pays 24-66, Kent County 23-66, and the G. R. H. & C. Ry. 19-66 of total cost which is $13,146.55.
* Indicates that construction was started but no payments made during 1916 fiscal year.

CONCLUDED.

	Contract awarded to—	Paid, 1914.	Paid, 1915.	Paid, 1916.	Estimated balance.	Total cost.
18	Smith, Byers, Sparks Co			$2,023 82		$5,602 40
	Wisconsin Bridge Co			3,578 58		
18	Nebel Bros			993 60	$1,331 40	2,325 00
16						
18	Peter Brill				2,828 00	2,828 00
18	J. P. Rusche			4,202 40	11,806 14	28,607 44
	Brookville Bridge Co				12,598 90	
18	Illinois Bridge Co			2,489 50		2,489 50
18	Smith, Byers, Sparks Co			1,069 42	381 72	2,253 29
	Michigan Bridge & Pipe Co			642 15	160 00	
18	Nebel Bros				3,893 00	3,950 29
	Jarvis Engine & Machine Works				57 29	
18	Peter Brill			1,550 00		1,550 00
20	W. B. Rogers			500 00	4,769 00	5,269 00
66	Hilding & Rabe			3,154 80	1,625 76	4,780 56
18	W. C. Small				3,685 00	3,685 00
18	C. H. Meredith				1,767 00	4,656 00
	Elkhart Bridge & Iron Co				2,889 00	
18	A. W. Baldwin				3,280 00	3,280 00
		$10,217 91	$89,303 17	$100,758 75	$66,972 57	$267,252 46

TABLE NO. 15.—*Trunk Line Road Construction.*

County.	Allowable mileage.	Mileage applied for.	Mileage built.	Total.	Gaps.
Alcona	56.730	....	....	....	56.730
Alger	75.195	11.335	6.781	18.116	57 079
Allegan	69.000	16.813	....	16.813	52.187
Alpena	48.246	3.042	....	3.042	45.204
Antrim	39.840	5.947	7.717	13.664	26.176
Arenac	30.582	....	....	....	30.582
Baraga	75.600	....	....	....	75.600
Barry	46.014	6.004	4.256	10.260	35.754
Bay	37.065	9.706	16.239	25.945	11.120
Benzie	26.580	12.540	18.698	31.238	—4.658
Berrien	47.325	29.993	14.468	44.461	2.864
Branch	41.730	12.857	14.476	27.333	14.397
Calhoun	58.224	12.717	18.203	30.920	27.304
Cass	40.665	.500	....	.500	40.165
Charlevoix	34.500	3.558	3.845	7.403	27.097
Cheboygan	60.333	26.423	7.904	34.327	26.006
Chippewa	128.625	96.353	....	96.353	32.272
Clare	47.430	13.527	12.271	25.798	21.632
Clinton	47.475	6.461	.500	6.961	40.514
Crawford	46.785	....	....	....	46.785
Delta	100.425	68.649	26.495	95.144	5.281
Dickinson	80.085	2.539	18.237	20.776	59.309
Eaton	47.655	12.417	3.700	16.117	31.538
Emmet	38.895	6.166	15.546	21.712	17.183
Genesee	53.490	....	16.471	16.471	37.019
Gladwin	43.020	24.675	....	24.675	18.345
Gogebic	93.075	9.148	3.060	12.208	80.867
Grand Traverse	38.175	12.630	17.186	29.816	8.359
Gratiot	47.490	2.974	11.808	14.782	32.708
Hillsdale	50.154	6.635	4.788	11.423	38.731
Houghton	87.600	3.299	23.277	26.576	61.024
Huron	69.645	16.215	12.502	28.717	40.928
Ingham	46.125	19.606	8.409	28.015	18.110
Ionia	47.760	13.847	9.368	23.215	24.545
Iosco	46.089	9.802	9.902	19.704	26.385
Iron	101.550	35.723	26.395	62.118	39.432
Isabella	48.000	2.004	.998	3.002	44.998
Jackson	59.295	19.916	14.892	34.808	24.487
Kalamazoo	46.575	10.856	19.764	30.620	15.955
Kalkaska	46.725	4.254	4.994	9.248	37.477
Kent	70.950	37.632	5.574	43.206	27.744
Keweenaw	47.085	6.361	2.727	9.088	37.997
Lake	47.565	6.307	1.000	7.307	40.258
Lapeer	55.170	....	....	....	55.170
Leelanau	28.500	8.436	7.577	16.013	12.487
Lenawee	62.820	21.743	1.010	22.753	40.067
Livingston	49.515	24.668	13.165	37.833	11.682
Luce	77.655	25.979	12.077	38.056	39.599
Mackinac	89.055	42.866	....	42.866	46.189
Macomb	39.954	6.286	8.261	14.547	25.407
Manistee	44.997	5.713	11.358	17.071	27.926
Marquette	150.675	32.185	17.682	49.867	100.808
Mason	41.085	7.981	1.900	9.881	31.204
Mecosta	47.115	18.653	7.431	26.084	21.031
Menominee	86.670	13.358	19.226	32.584	54.086
Midland	43.740	26.569	10.345	36.914	6.826
Missaukee	47.250	7.011	1.000	8.011	39.239
Monroe	46.140	27.465	1.004	28.469	17.671
Montcalm	59.160	8.306	2.136	10.442	48.718
Montmorency	46.275	....	....	....	46.275
Muskegon	41.865	9.323	28.585	37.908	3.957
Newaygo	70.557	28.715	10.246	38.961	31.596
Oakland	74.925	38.865	15.883	54.748	20.177
Oceana	44.910	19.558	14.635	34.193	10.717
Ogemaw	47.670	5.504	6.445	11.949	35.721



Road ditches are an important factor. Calhoun county has gone over their entire county road system and constructed driveway culverts similar to the above so that the side ditches will not be dammed by careless driveway construction.

TABLE NO. 15.—CONCLUDED.

County.	Allowable mileage.	Mileage applied for.	Mileage built.	Total.	Gaps.
Ontonagon	111.570	24.860	5.000	29.860	81.710
Osceola	47.835	21.985	11.015	33.000	14.835
Oscoda	47.556	....	....	....	47.556
Otsego	43.500	3.250	....	3.250	40.250
Ottawa	45.930	6.951	5.456	12.407	33.523
Presque Isle	55.749	3.994	5.882	9.876	45.873
Roscommon	56.640	3.000	....	3.000	53.640
Saginaw	64.725	20.491	23.987	44.478	20.247
Sanilac	80.190	7.076	7.500	14.576	65.614
Schoolcraft	102.225	15.276	5.804	21.080	81.145
Shiawassee	44.775	15.937	7.127	23.064	21.711
St. Clair	55.500	29.566	10.607	40.173	15.327
St. Joseph	41.856	6.769	1.002	7.771	34.085
Tuscola	67.545	16.782	11.276	28.058	39.487
Van Buren	50.880	7.093	11.722	18.815	32.065
Washtenaw	59.244	6.863	3.605	10.468	48.776
Wayne	51.245	....	51.245	51.245	....
Wexford	47.655	4.521	14.956	19.477	28.178
Total	4,785.695	1,173.029	748.601	1,921.630	2,864.065

TABLE NO. 16.—*Automobile Tax Distribution, July 1, 1916.*

County.	Total amount received.	Amount apportioned to county.
Alcona	$840 50	$420 25
Alger	1,233 40	616 70
Allegan	17,940 85	8,970 42
Alpena	4,995 05	2,497 52
Antrim	3,139 71	1,569 85
Arenac	2,499 55	1,249 77
Baraga	627 00	313 50
Barry	13,178 25	6,589 12
Bay	22,031 26	11,015 63
Benzie	1,830 60	915 30
Berrien	27,197 06	13,598 53
Branch	17,356 14	8,678 07
Calhoun	37,343 60	18,671 80
Cass	11,230 30	5,615 15
Charlevoix	4,739 80	2,369 90
Cheboygan	3,048 30	1,524 15
Chippewa	3,938 75	1,969 37
Clare	2,222 95	1,111 47
Clinton	18,383 25	9,191 02
Crawford	1,470 15	735 67
Delta	6,056 00	3,028 00
Dickinson	4,347 80	2,173 90
Eaton	20,953 49	10,476 74
Emmet	5,758 95	2,879 47
Genesee	44,692 95	22,346 47
Gladwin	2,077 50	1,038 75
Gogebic	3,921 95	1,960 97
Grand Traverse	8,455 90	4,227 95
Gratiot	17,879 55	8,939 77
Hillsdale	20,209 55	10,104 77
Houghton	12,658 94	6,329 47
Huron	13,695 25	6,847 62
Ingham	45,182 75	22,591 37
Ionia	20,766 11	10,383 05
Iosco	2,115 90	1,057 95
Iron	4,503 50	2,251 75
Isabella	9,256 10	4,628 05
Jackson	37,098 32	18,549 16
Kalamazoo	35,242 20	17,621 10
Kalkaska	1,269 26	634 63
Kent	85,563 42	42,781 71
Keweenaw	921 20	460 60
Lake	1,121 50	560 75
Lapeer	13,604 88	6,802 44
Leelanau	3,585 25	1,792 62
Lenawee	33,297 66	16,648 83
Livingston	12,878 15	6,439 07
Luce	750 50	375 25
Mackinaw	1,279 24	639 62
Macomb	17,093 90	8,546 95
Manistee	4,597 42	2,299 21
Marquette	7,313 05	3,656 52
Mecosta	7,344 55	3,672 27
Mason	6,340 60	3,170 30
Menominee	5,821 17	2,910 58
Midland	5,118 65	2,559 32
Missaukee	1,913 70	956 85
Monroe	15,363 60	7,681 80
Montcalm	17,647 02	8,823 51
Montmorency	770 25	385 12
Muskegon	15,366 15	7,683 07
Newaygo	6,315 45	3,157 72
Oakland	40,909 95	20,454 97
Oceana	5,832 18	2,916 09
Ogemaw	1,654 75	827 37

TABLE NO. 16.—CONCLUDED.

County.	Total amount received.	Amount apportioned to county.
Ontonagon	$1,906 84	$953 42
Osceola	5,019 60	2,509 80
Oscoda	407 00	203 50
Otsego	1,714 50	857 25
Ottawa	17,125 40	8,562 70
Presque Isle	2,066 00	1,033 00
Roscommon	681 00	340 50
Saginaw	38,651 33	19,325 66
Sanilac	13,527 70	6,763 85
Schoolcraft	1,546 85	773 42
Shiawassee	22,355 53	11,177 76
St. Clair	18,144 56	9,072 28
St. Joseph	17,108 90	8,554 45
Tuscola	17,120 15	8,560 07
Van Buren	17,341 06	8,670 53
Washtenaw	35,675 05	17,837 52
Wayne	426,988 95	213,494 47
Wexford	5,800 33	2,900 16
Total	$1,466,974 38	$733,487 01

The above is the amount apportioned to counties July 1, 1916. Another apportionment will be made Jan. 1, 1917, for the remainder of the year.

TABLE NO. 17.—*Miles of road built and reward paid by years and totals for succeeding years.*

Fiscal years.	Miles of road built.								Reward paid.		
	A.	B.	C.	D.	E.	F.	G.	Total.	Single.	Trunk line.	Total.
1906..	....	8.850	....	....	9.250	....	....	18.100	$13,675	....	....
1907..	....	24.700	1.333	....	38.351	....	....	64.384	51,701	....	....
	....	*33.550*	*1.333*	....	*47.601*	....	....	*82.484*	*65.376*	....	....
1908..	1.000	47.540	.522	....	47.317	....	....	96.379	71.729	....	....
	1.000	*81.090*	*1.855*	....	*94.918*	....	....	*178.863*	*137,105*	....	....
1909..	....	88.266	1.776	2.511	69.674	....	....	162.227	117,021	....	....
	1.000	*169.356*	*3.631*	*2.511*	*164.592*	....	....	*341.090*	*254,126*	....	....
1910..	2.744	127.820	1.000	3.335	69.479	....	....	204.378	137,327	....	....
	3.744	*297.176*	*4.631*	*5.846*	*234.071*	....	....	*545.468*	*391,453*	....	....
1911..	....	216.200	6.540	2.375	79.090	....	....	304.205	193,876	....	....
	3.744	*513.376*	*11.171*	*8.221*	*313.161*	....	....	*849.673*	*585,329*	....	....
1912..	14.544	236.842	12.500	1.912	100.125	16.680	....	382.603	249,671	....	....
	18.288	*750.218*	*23.671*	*10.133*	*413.286*	*16.680*	....	*1,232.276*	*835,000*	....	....
1913..	20.693	341.887	15.232	8.702	104.825	30.658	....	521.997	329,392	....	....
	38.981	*1,092.105*	*38.903*	*18.835*	*518.111*	*47.338*	....	*1,754.273*	*1,164,392*	....	....
1914..	13.396	478.125	37.964	4.008	129.268	19.554	....	682.315	464,093	$117,643	$581,736
	52.377	*1,570.230*	*76.867*	*22.843*	*647.379*	*66.892*	....	*2,436.588*	*1,628,485*	*117,643*	*1,746,128*
1915..	24.434	487.705	64.749	9.045	141.841	31.900	.104	759.778	583,895	199,671	783,566
	76.811	*2,057.935*	*141.616*	*31.888*	*789.220*	*98.792*	*.104*	*3,196.366*	*2,212,380*	*317,314*	*2,529,694*
1916..	25.940	480.049	70.464	3.007	138.886	25.248	....	743.594	576,726	180,806	757,532
	102.751	*2,537.984*	*212.080*	*34.895*	*928.106*	*124.040*	*.104*	*3,939.960*	*2,789,106*	*498,120*	*3,287,226*
Per cent of total.	2.61	64.42	5.38	0.85	23.59	3.15	0.00	....	....	....	....

Figures in italics are the totals in their respective columns for the year indicated.

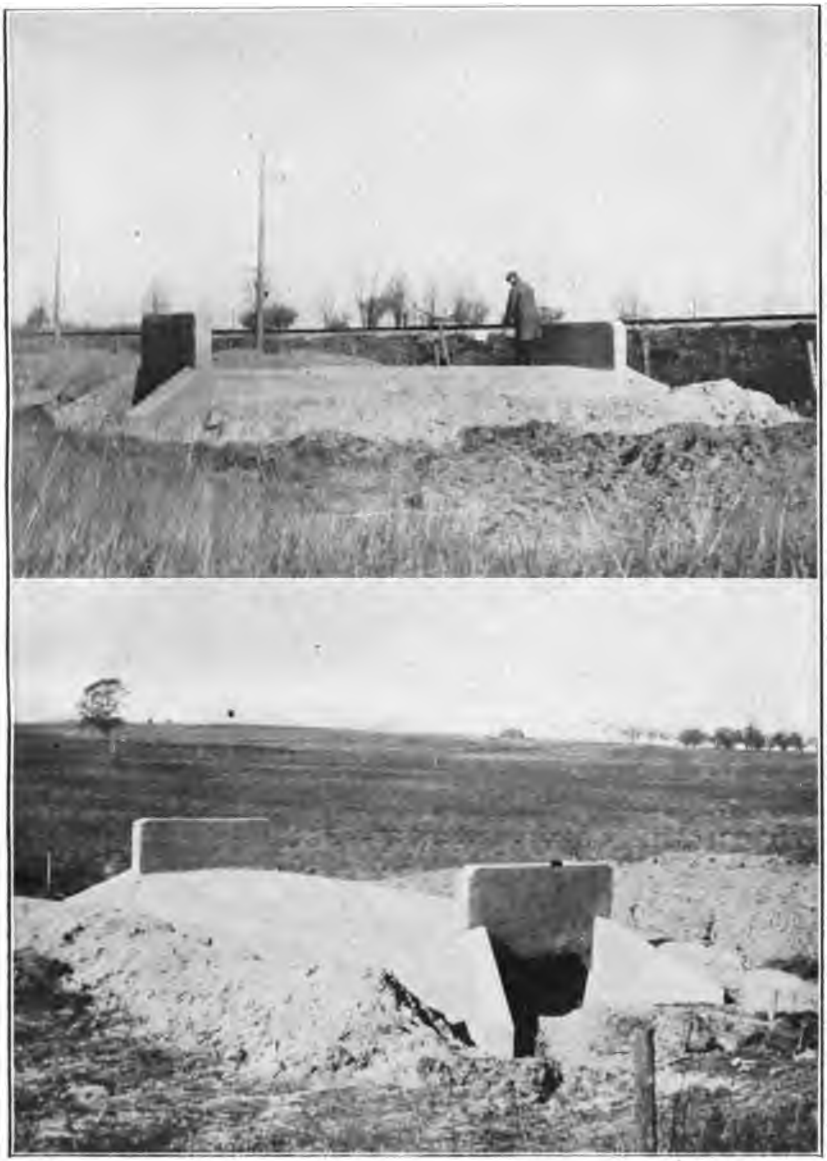
TABLE NO. 18.—*Cost of roads, average cost per mile and ratio of reward to cost, by classes and widths to June 30, 1915.*

County.	Class and width.	Miles.	Cost.		Average cost per mile.	Reward.		Paid 50 per cent additional.	Per cent cost paid by State.
			Original.	Rebuilt.		Original.	Rebuilt.		
Alger	E-9—E-14 S. R.	8.551	$66,247 14	$7,231 11	$8,593 00	$8,551 00	$4,276 00		17.4
	E-14 S. R.	2.500	14,063 94		5,626 00	3,750 00			26.7
Total		11.051	$80,311 08	$7,231 11		$12,301 00	$4,276 00		
Allegan	A-9 S. R.	.800	$880 00		$1,100 00	$200 00			22.7
	B-9 S. R.	.804	1,321 58		1,644 00	402 00			30.4
	B-10 S. R.	2.458	6,275 74		2,553 00	1,353 00			21 6
	B-12 S. R.	.284	820 80		2,890 00	185 00			22.6
	C-9 S. R.	2.503	5,818 69		2,325 00	1,878 00			32.3
	E-9 S. R.	4.608	22,894 48		4,968 00	4,608 00			20.1
Total		11.457	$38,011 29			$8,626 00			
Antrim	B-9 S. R.	47.126	$111,569 23		$2,368 00	$23,563 00		$425 00	21.7
	B-12 S. R.	1.000	2,483 89		2,484 00	650 00			26.2
	B-9—B-14 T. L.	.891	2,668 17	$1,706 51	4,909 00	445 00	$891 00		30.5
	B-14 T. L.	.643	2,120 69		3,298 00	964 00			45.5
	B-15 T. L.	.511	2,525 16		4,942 00	817 00			32.5
	C-9 S. R.	1.004	2,954 59		2,943 00	753 00			25.5
	D-9 S. R.	4.663	10,505 17		2,253 00	3,497 00		690 00	39.9
	B-9—D-14 T. L.	.624	989 04	2,130 00	4,998 00	312 00	1,092 00		45.0
Total		56.462	$135,815 94	$3,836 51		$31,001 00	$1,983 00	$1,115 00	
Arenac	B-9 S. R.	1.010	$1,895 00		$1,876 00	$505 00			26.6
	B-12 S. R.	1.013	2,868 03		2,831 00	658 00			22.9
Total		2.023	$4,763 03			$1,163 00			
Barry	B-9 S. R.	37.634	$72,192 73		$1,919 00	$18,817 00			26.1
	B-16 T. L.	3.256	12,054 40		3,702 00	5,536 00			47.1
Total		40.890	$84,247 13			$24,353 00			
Bay	B-9 S. R.	3.738	$11,589 59		$3,101 00	$1,869 00			16.1
	B-10 S. R.	.998	3,092 60		3,099 00	549 00			17.8
	C-9 S. R.	1.445	5,515 00		3,817 00	1,084 00			19.6
	E-9 S. R.	61.180	246,012 31		4,021 00	61,180 00		$6,870 00	27.7
	F-9 S. R.	.161	1,341 70		8,333 00	161 00			12.0
	E-9—F-16 T. L.	1.000	3,406 30	$9,675 96	13,082 00	1,000 00	$2,400 00		26 0
Total		68.522	$270,957 50	$9,675 96		$65,843 00	$2,400 00	$6,870 00	

Concrete culvert between Lansing and Mason built according to the plans of the State Highway Department by the Ingham County Road Commission.

TABLE NO. 18.—*Cost of roads, average cost per mile and ratio of reward to cost, by classes and widths to June 30, 1915.*

County.	Class and width.	Miles.	Cost.		Average cost per mile.	Reward.		Paid 50 per cent additional.	Per cent cost paid by State.
			Original.	Rebuilt.		Original.	Rebuilt.		
Alger	E-9—E-14 S. R.	8.551	$66,247 14	$7,231 11	$8,593 00	$8,551 00	$4,276 00		17.4
	E-14 S. R.	2.500	14,063 94		5,626 00	3,750 00			26.7
Total		11.051	$80,311 08	$7,231 11		$12,301 00	$4,276 00		
Allegan	A-9 S. R.	.800	$880 00		$1,100 00	$200 00			22.7
	B-9 S. R.	.804	1,321 58		1,644 00	402 00			30.4
	B-10 S. R.	2.458	6,275 74		2,553 00	1,353 00			21.6
	B-12 S. R.	.284	820 80		2,890 00	185 00			22.6
	C-9 S. R.	2.503	5,818 69		2,325 00	1,878 00			32.3
	E-9 S. R.	4.608	22,894 48		4,968 00	4,608 00			20.1
Total		11.457	$38,011 29			$8,626 00			
Antrim	B-9 S. R.	47.126	$111,569 23		$2,368 00	$23,563 00		$425 00	21.7
	B-12 S. R.	1.000	2,483 89		2,484 00	650 00			26.2
	B-9—B-14 T. L.	.891	2,668 17	$1,706 51	4,909 00	445 00	$891 00		30.5
	B-14 T. L.	.643	2,120 69		3,298 00	964 00			45.5
	B-15 T. L.	.511	2,525 16		4,942 00	817 00			32.5
	C-9 S. R.	1.004	2,954 59		2,943 00	753 00			25.5
	D-9 S. R.	4.663	10,505 17		2,253 00	3,497 00		690 00	39.9
	B-9—D-14 T. L.	.624	989 04	2,130 00	4,998 00	312 00	1,092 00		45.0
Total		56.462	$135,815 94	$3,836 51		$31,001 00	$1,983 00	$1,115 00	
Arenac	B-9 S. R.	1.010	$1,895 00		$1,876 00	$505 00			26.6
	B-12 S. R.	1.013	2,868 03		2,831 00	658 00			22.9
Total		2.023	$4,763 03			$1,163 00			
Barry	B-9 S. R.	37.634	$72,192 73		$1,919 00	$18,817 00			26.1
	B-16 T. L.	3.256	12,054 40		3,702 00	5,536 00			47.1
Total		40.890	$84,247 13			$24,353 00			
Bay	B-9 S. R.	3.738	$11,589 59		$3,101 00	$1,869 00			16.1
	B-10 S. R.	.998	3,092 60		3,099 00	549 00			17.8
	C-9 S. R.	1.445	5,515 00		3,817 00	1,084 00			19.6
	E-9 S. R.	61.180	246,012 31		4,021 00	61,180 00		$6,870 00	27.7
	F-9 S. R.	.161	1,341 70		8,333 00	161 00			12.0
	E-9—F-16 T. L.	1.000	3,406 30	$9,675 96	13,082 00	1,000 00	$2,400 00		26 0
Total		68.522	$270,957 50	$9,675 96		$65,843 00	$2,400 00	$6,870 00	



Concrete culvert between Lansing and Mason built according to the plans of the State Highway Department by the Ingham County Road Commission.

Benzie	A-9 S. R.	1.502	$1,975 00		$1,315 00	$376 00			19.0
	B-9 S. R.	47.448	102,506 10		2,160 00	23,724 00		$1,438 00	24.5
	B-10 S. R.	2.136	6,387 84		2,990 00	1,450 00			22.7
	B-12 S. R.	2.136	3,860 20		1,807 00	1,386 00			35.9
	B-12 T. L.	1.776	4,709 37		2,652 00	2,308 00			50.6
	B-14 T. L.	.988	2,731 90	$2,765 08	5,564 00	1,480 00			28.8
	B-15 T. L.	1.742	3,637 50		2,089 00	2,788 00			76.6
	B-16 S. R.	.227	2,000 00		8,810 00	193 00			9.6
	E-12 T. L.	.748	4,515 00		6,036 00	1,948 00			43.1
Total		58.703	$132,322 91	$2,765 08		$35,653 00		$1,438 00	
Berrien	A-9 S. R.	.250	$597 00		$2,388 00	$63 00			10.5
	B-9 S. R.	3.641	12,781 07		3,510 00	1,820 00			14.2
	B-12 S. R.	.500	2,136 94		4,274 00	325 00			15.2
	C-9 S. R.	1.000	4,334 80		4,335 00	750 00			17.4
	D-9 S. R.	2.375	9,413 90		3,963 00	1,781 00			18.9
	E-9 S. R.	26.423	126,403 15		4,784 00	26,423 00			20.9
	E-10 S. R.	2.818	17,418 27		6,181 00	3,100 00			17.8
	E-12 S. R.	30.184	204,520 63		6,776 00	39,239 00			19.2
	E-14 S. R.	1.001	6,824 05		6,817 00	1,502 00			22.0
	E-16 T. L.	2.629	23,178 34	$6,661 20	11,350 00	10,776 00	$2,312 00		43.9
	F-9 S. R.	.889	6,453 01		7,259 00	889 00			13.8
Total		71.710	$414,061 16	$6,661 20		$86,668 00	$2,312 00		
Branch	B-9 S. R.	32.368	$75,238 16		$2,324 00	$16,184 00			21.5
	B-16 S. R.	1.881	6,543 29		3,479 00	1,599 00			23.8
Total		34.249	$81,781 45			$17,783 00			
Calhoun	B-9 S. R.	93.485	$190,944 99		$2,043 00	$46,743 00			24.5
	B-9—B-16 T. L.	1.000	1,817 00	$1,200 00	3,017 00	500 00	$1,200 00		56.2
	B-16 T. L.	7.295	31,089 65		4,262 00	12,402 00			39.9
	C-9 S. R.	1.320	4,264 00		3,230 00	990 00			23.2
	C-16 S. R.	.340	2,611 30		7,680 00	434 00			16.6
	E-9 S. R.	10.545	39,788 89		3,773 00	10,545 00			26.5
	E-12 S. R.	.178	916 00		5,146 00	231 00			25.2
	E-16 S. R.	.513	3,150 00		6,140 00	872 00			27.7
Total		114.676	$274,581 83	$1,200 00		$72,717 00	$1,200 00		
Cass	B-9 S. R.	39.562	$81,415 98		$2,058 00	$19,781 00			24.3
	C-9 S. R.	2.075	4,033 00		1,944 00	1,556 00			38.8
Total		41.637	$85,448 98			$21,337 00			
Charlevoix	B-9 S. R.	7.477	$17,816 79		$2,383 00	$3,739 00			21.0
	B-15 T. L.	1.970	7,733 55		3,926 00	3,152 00			40.8
	E-9 S. R.	8.773	33,082 72		3,771 00	8,773 00			26.4
Total		18.220	$58,633 16			$15,664 00			

TABLE NO. 18.—CONTINUED.

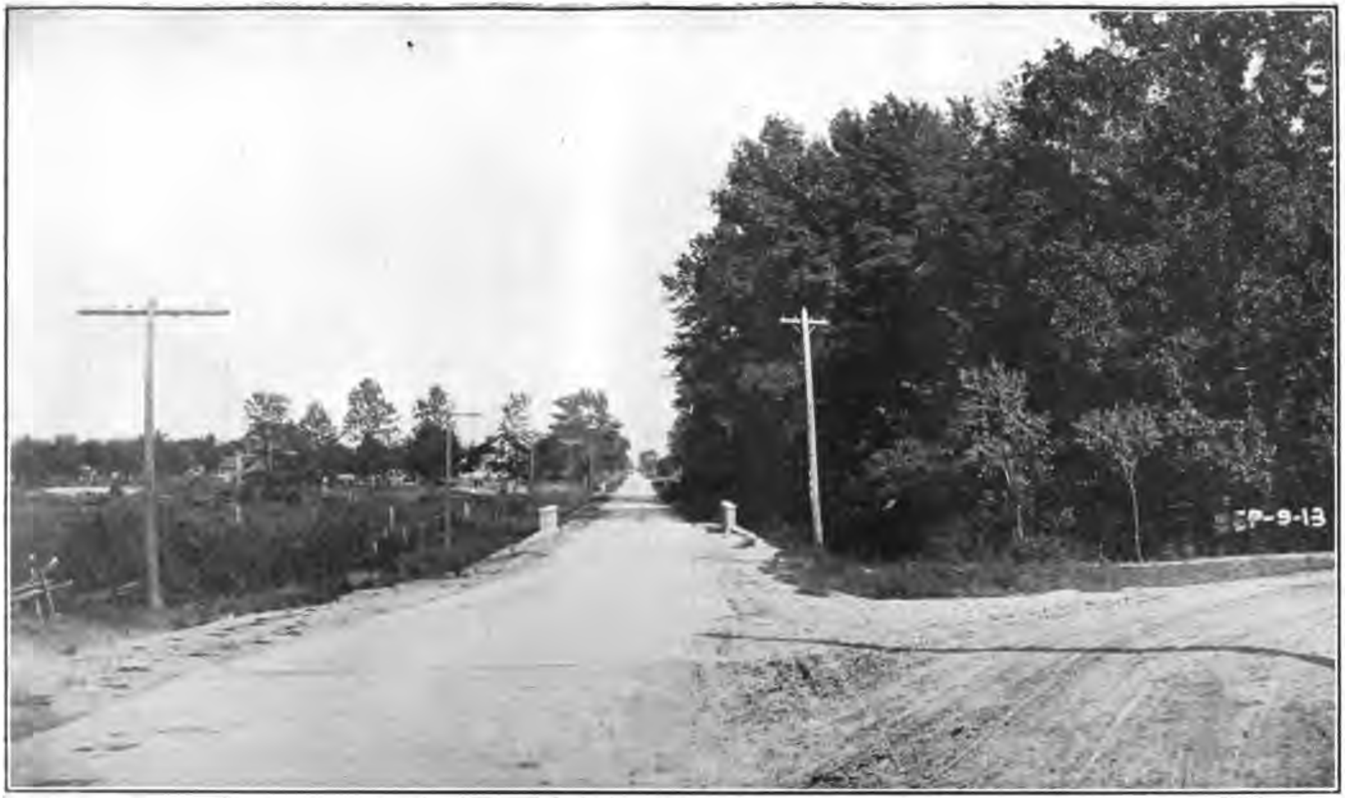
County.	Class and width.	Miles.	Cost.		Average cost per mile.	Reward.		Paid 50 per cent additional.	Per cent cost paid by State.
			Original.	Rebuilt.		Original.	Rebuilt.		
Cheboygan	B-9 S. R.	3.576	$10,347 90		$2,894 00	$1,788 00			17.3
	C-9 S. R.	2.630	7,473 84		2,842 00	1,973 00			26.4
	D-9 S. R.	1.515	4,101 00		2,707 00	1,136 00			27.7
	E-9 S. R.	11.802	38,249 30		3,241 00	11,802 00			30.9
	E-12 S. R.	.500	2,390 36		4,781 00	650 00			27.2
	E-14 S. R.	1.345	4,813 13		3,579 00	2,018 00			42.0
Total		21.368	$67,375 53			$19,367 00			
Clare	A-9 S. R.	1.000	$918 00		$918 00	$250 00			27.2
	B-9 S. R.	17.479	30,382 56		1,738 00	8,739 00		$1,068 00	32.3
	B-12 T. L.	1.250	2,754 80		2,204 00	1,626 00			59.0
	B-9—B-15 T. L.	1.004	1,564 70	$2,335 25	3,884 00	502 00	$1,104 00		41.2
	B-15 T. L.	1.004	2,365 00		2,355 00	1,606 00			56.8
Total		21.737	$37,985 06	$2,335 25		$12,723 00	$1,104 00	$1,068 00	
Clinton	B-9 S. R.	4.212	$8,950 00		$2,125 00	$2,106 00			23.5
	C-9 S. R.	.663	2,249 58		3,393 00	497 00			22.1
Total		4.875	$11,199 58			$2,603 00			
Crawford	A-9 S. R.	4.980	$2,176 00		$437 00	$1,245 00			57.2
	B-9 S. R.	10.938	21,699 67		1,984 00	5,469 00			25.2
	C-9 S. R.	4.294	17,128 37		3,989 00	3,220 00			18.8
	E-9 S. R.	1.000	2,708 75		2,709 00	1,000 00			37.0
Total		21.212	$43,712 79			$10,934 00			
Delta	*E-9 S. R.	42.101	$213,611 23		$5,074 00	$42,101 00			19.7
	E-16 S. R.	.667	3,914 39		5,869 00	1,134 00			29.0
	E-9—E-16 T. L.	3.644	19,540 12	$6,569 04	7,165 00	3,644 00	$8,746 00		47.5
	E-16 T. L.	5.804	31,990 30		5,512 00	19,734 00			61.7
Total		52.216	$269,056 04	$6,569 04		$66,613 00	$8,746 00		
Dickinson	*E-9 S. R.	15.576	$95,678 25		$6,143 00	$15,576 00		$5,421 00	21.9
Total		15.576	$95,678 25			$15,576 00		$5,421 00	
Eaton	B-9 S. R.	78.879	$142,422 92		$1,806 00	$39,440 00			27.7
	B-16 S. R.	1.000	4,072 00		4,072 00	850 00			20.9
Total		79.879	$146,494 92			$40,290 00			

Emmet	B-9	S. R.	11.696	$42,239 75		$3,698 00	$5,848 00		$1,574 00	17.6
	B-15	T. L.	2.548	11,557 31		4,535 00	4,076 00			35.3
	D-9	S. R.	.142	497 00		3,500 00	106 00			21.5
	E-9	S. R.	11.669	48,510 04		4,158 00	11,669 00		1,420 00	27.0
	E-15	T. L.	.754	5,249 07		6,962 00	2,412 00			47.8
Total			26.809	$108,053 17			$24,111 00		$2,994 00	
Genesee	A-9—B-9	S. R.	.678	$1,246 00		$1,838 00	$170 00	$169 00		27.2
	B-9	S. R.	120.361	334,904 65		2,782 00	60,181 00		$1,871 00	18.6
	B-16	S. R.	2.651	12,072 39		4,554 00	2,253 00			18.7
	C-9	S. R.	14.931	59,175 98		3,963 00	11,198 00		2,121 00	18.9
	C-9—C-16	S. R.	.524	4,945 00	$1,872 87	13,011 00	393 00	275 00		13.5
	D-9	S. R.	10.394	51,238 64		4,930 00	7,796 00		781 00	16.7
	E-9	S. R.	13.085	79,821 60		6,100 00	13,085 00		625 00	17.2
Total			162.624	$543,404 26	$1,872 87		$95,076 00	$444 00	$5,398 00	
Gladwin	B-9	S. R.	1.004	$1,522 36		$1,516 00	$502 00			33.0
Total			1.004	$1,522 36			$502 00			
Gogebic	*B-9	S. R.	3.578	$17,549 00		$4,905 00	$1,789 00			10.1
	*E-9	S. R.	3.060	31,194 31		10,194 00	3,060 00		$1,530 00	19.7
Total			6.638	$48,743 31			$4,849 00		$1,530 00	
Grand Traverse	A-9	S. R.	.920	$4,172 16		$4,535 00	$230 00			5.5
	*B-9	S. R.	26.745	72,812 80		2,722 00	13,373 00		$1,610 00	20.6
	B-11	S. R.	1.051	4,051 08		3,854 00	630 00			15.6
	B-12	S. R.	9.296	27,099 40		2,915 00	6,042 00			22.3
	B-14	S. R.	3.011	7,523 23		2,498 00	2,258 00			30.0
	B-14	T. L.	2.690	29,694 94		11,039 00	4,034 00			13.6
	B-9—B-14	T. L.	3.428	6,811 99	$274 00	2,068 00	1,714 00	$2,275 00		56.2
	B-9—C-16	T. L.	2.780	7,601 15	6,927 14	5,226 00	1,390 00	5,696 00		48.8
	D-9	S. R.	.313	586 36		1,873 00	235 00			40.1
	D-10	S. R.	.498	1,101 16		2,211 00	411 00			37.3
Total			50.732	$161,454 27	$7,201 14		$30,317 00	$7,971 00	$1,610 00	
Gratiot	A-9	S. R.	22.185	$28,900 12		$1,303 00	$5,546 00			19.2
	B-9	S. R.	111.440	155,461 80		1,395 00	55,720 00		$2,505 00	37.5
	B-16	T. L.	1.020	4,728 00		2,271 00	1,734 00			36.7
Total			134.645	$189,089 92			$63,000 00		$2,505 00	
Hillsdale	B-9	S. R.	28.022	$60,422 55		$2,156 00	$14,011 00			23.0
	E-9	S. R.	8.403	22,336 54		2,658 00	8,403 00			37.6
	E-12	S. R.	1.326	4,370 76		3,296 00	1,723 00			39.4
Total			37.751	$87,129 85			$24,137 00			

*Rewarded as 9 ft. wide, but built 14-16 feet wide, before extra state reward was allowed on wider roads.

TABLE NO. 18.—CONTINUED.

County.	Class and width.	Miles.	Cost. Original.	Cost. Rebuilt.	Average cost per mile.	Reward. Original.	Reward. Rebuilt.	Paid 50 per cent additional.	Per cent cost paid by State.
Houghton	B-15 S. R.	.890	$4,391 00		$4,934 00	$712 00			16.2
	C-15 S. R.	2.220	18,918 97		8,522 00	2,664 00			14.0
	*E-9 S. R.	6.669	45,132 19		6,767 00	6,669 00		$3,334 00	22.2
	E-15 T. L.	11.539	91,612 15		7,939 00	36,922 00			40.3
Total		21.318	$160,054 31			$46,967 00		$3,334 00	
Huron	A-9 S. R.	3.690	$12,882 97		$3,491 00	$922 00			7.2
	B-9 S. R.	56.856	114,277 85		2,010 00	28,428 00			24.9
	B-15 T. L.	5.503	18,525 00		3,366 00	8,804 00			47.5
	C-9 S. R.	4.436	17,685 18		3,987 00	3,327 00			18.8
	E-9 S. R.	33.683	133,220 11		3,955 00	33,683 00			25.2
	F-9 S. R.	2.068	11,688 72		5,654 00	2,068 00			17.8
Total		106.236	$308,279 83			$77,232 00			
Ingham	A-9 S. R.	.500	$624 60		$1,249 00	$125 00			20.0
	B-9 S. R.	26.954	61,903 04		2,297 00	13,477 00			21.8
	C-9 S. R.	3.408	14,485 72		4,251 00	2,556 00			17.7
	E-9—C-16 T. L.	1.186	8,091 09	$4,667 41	10,758 00	1,186 00	$1,732 00		22.8
	*E-9 S. R.	.814	5,394 08		6,627 00	814 00			15.1
Total		32.862	$90,508 53	$4,667 41		$18,158 00	$1,732 00		
Ionia	B-9 S. R.	36.266	$70,332 63		$1,940 00	$18,133 00		$439 00	26.4
	B-16 T. L.	1.000	5,148 45		5,148 00	1,700 00			33.0
Total		37.266	$75,481 08			$19,833 00		$439 00	
Iosco	A-9 S. R.	4.510	$9,336 84		$2,070 00	$1,128 00			12.1
	A-9 T. L.	.986	616 51		625 00	492 00			79.9
	B-12 T. L.	1.500	5,477 87		3,652 00	1,950 00			35.7
	E-9 S. R.	5.364	16,807 52		3,133 00	5,364 00		$1,940 00	43.5
Total		12.360	$32,238 74			$8,934 00		$1,940 00	
Iron	*B-9 S. R.	5.416	$33,770 47		$6,235 00	$2,706 00		$597 00	9.8
	C-16 T. L.	4.474	36,795 70		8,225 00	11,408 00			35.6
	E-16 S. R.	2.552	27,122 23		10,628 00	4,338 00			16.0
	E-16 T. L.	4.510	38,531 70		8,543 00	15,334 00			39.8
Total		16.952	$136,220 10			$33,786 00		$597 00	



Wayne county concrete road joined by a gravel road. Both types of construction have their place, the former for heavily traveled thoroughfares and the latter for roads having a moderate traffic.

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Isabella	B-9	S. R.	56.800	$98,641 29		$1,737 00	$28,399 00			28.7
Total			56.800	$98,641 29			$28,399 00			
Jackson	A-9	S. R.	2.188	$4,531 70		$2,071 00	$547 00			12.1
	B-9	S. R.	37.628	101,643 60		2,674 00	18,814 00			18.5
	B-12	S. R.	2.002	7,887 80		3,940 00	1,301 00			16.5
	B-16	S. R.	.386	2,898 40		7,509 00	328 00			11.3
	B-16	T. L.	4.653	20,759 80		4,462 00	7,910 00			38.1
	C-16	S. R.	.754	8,400 00		11,141 00	961 00			11.4
	C-16	T. L.	4.974	33,058 41		6,646 00	12,664 00			38.3
	E-9	S. R.	4.500	16,888 06		3,753 00	4,500 00			26.7
Total			57.085	$196,067 77			$47,025 00			
Kalamazoo	A-9	S. R.	2.740	$4,337 82		$1,583 00	$685 00			15.8
	B-9	S. R.	67.587	165,089 16		2,443 00	33,794 00		$2,430 00	21.9
	B-12	S. R.	.428	1,260 00		2,710 00	278 00			22.1
	B-13	S. R.	.198	757 00		3,823 00	139 00			18.4
	B-14	S. R.	3.209	10,944 73		3,411 00	2,407 00			22.0
	B-16	S. R.	.624	2,761 39		4,425 00	531 00			19.2
	B-16	T. L.	6.131	23,993 00		3,913 00	10,422 00			43.4
	B-9—B-16	T. L.	.500	1,190 39	$520 00	3,421 00	250 00	$600 00		49.7
	C-16	T. L.	.500	3,790 70		7,581 00	1,275 00			33.6
	D-9	S. R.	1.000	4,080 22		4,080 00	750 00			18.4
	E-9	S. R.	15.136	69,446 36		4,588 00	15,136 00			21.8
	E-16	T. L.	.500	4,196 00		8,392 00	1,700 00			40.5
	F-9	S. R.	1.176	10,244 63		8,711 00	1,176 00			11.4
Total			99.729	$302,091 40	$520 00		$68,543 00	$600 00	$2,430 00	
Kalkaska	A-9	S. R.	3.408	$9,850 04		$2,891 00	$852 00			8.6
	B-9	S. R.	32.591	87,871 54		2,696 00	16,295 00			18.5
	D-9	S. R.	1.994	7,618 85		3,821 00	1,496 00			19.6
	E-9	S. R.	6.786	23,766 25		3,502 00	6,786 00			28.1
Total			44.779	$129,056 68			$25,429 00			
Kent	B-9	S. R.	46.443	$70,773 08		$1,739 00	$23,222 00			32.6
	B-10	S. R.	11.203	79,136 20		7,064 00	6,162 00			7.8
	B-12	S. R.	1.486	7,862 35		5,964 00	966 00			12.3
	B-16	T. L.	.502	3,653 00		7,277 00	854 00			23.4
	E-9	S. R.	2.997	9,277 99		3,096 00	2,997 00			32.3
	B-9—F-16	T. L.	.536	3,400 00	$2,094 11	10,250 00	268 00	$1,554 00		33.1
	F-16	T. L.	.492	4,188 23		8,513 00	1,672 00			39.9
Total			63.659	$178,290 85	$2,094 11		$36,141 00	$1,554 00		
Keweenaw	*E-9	S. R.	2.002	$4,754 81		$2,375 00	$2,002 00			42.1
Total			2.002	$4,754 81			$2,002 00			

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*Rewarded as 9 ft. wide, but built 14-16 feet wide, before extra state reward was allowed on wider roads.

TABLE NO. 18.—CONTINUED.

County.	Class and width.	Miles.	Cost.		Average cost per mile.	Reward.		Paid 50 per cent additional.	Per cent cost paid by State.
			Original.	Rebuilt.		Original.	Rebuilt.		
Lake	B9 S. R.	10.370	$19,834 31		$1,913 00	$5,185 00			26.1
Total		10.370	$19,834 31			$5,185 00			
Lapeer	A-9 S. R.	1.004	$1,250 00		$1,245 00	$251 00			20.1
	B-9 S. R.	27.237	73,653 52		2,704 00	13,619 00			18.5
	C-9 S. R.	5.509	18,365 33		3,334 00	4,131 00			22.1
	C-12 S. R.	.502	2,118 62		4,220 00	489 00			23.1
Total		34.252	$95,387 47			$18,490 00			
Leelanau	B-9 S. R.	8.442	$18,080 02		$2,142 00	$4,221 00			23.3
	B-12 T. L.	1.306	3,462 00		2,651 00	1,698 00			49.0
Total		9.748	$21,542 02			$5,919 00			
Lenawee	A-9 S. R.	1.010	$940 00		$931 00	$404 00			43.0
	E-12 S. R.	1.024	4,969 69		4,853 00	1,331 00			26.7
Total		2.034	$5,909 69			$1,735 00			
Livingston	B-9 S. R.	44.773	$92,524 38		$2,066 00	$22,387 00		$817 00	25.1
	B-14 S. R.	.165	543 35		3,293 00	124 00			22.8
	B-14 T. L.	1.745	4,125 00		2,364 00	2,618 00		63 00	63.4
Total		46.683	$97,192 73			$25,129 00		$880 00	
Luce	D-9 S. R.	.999	$4,766 42		$4,766 42	$750 00			15.7
Total		.999	$4,766 42			$750 00			
Macomb	B-9 S. R.	3.074	$9,294 79		$3,024 00	$1,537 00			16.5
	C-9 S. R.	.408	2,578 84		6,320 00	306 00			11.9
	C-10 S. R.	2.048	8,997 71		4,393 00	1,690 00			22.3
	C-12 S. R.	.468	2,416 33		5,163 00	456 00			18.9
	C-14 S. R.	4.736	27,280 72		5,760 00	5,328 00			19.5
	C-16 S. R.	1.339	7,387 26		5,517 00	1,708 00			23.1
	C-16 T. L.	4.996	40,776 01		4,162 00	12,740 00			31.2
	E-9 S. R.	2.000	12,178 40		6,089 00	2,000 00			16.4
	E-16 S. R.	1.752	11,009 63		6,284 00	2,978 00			27.1
Total		20.821	$121,919 69			$28,743 00			

Manistee	A-9	S. R.	1.120	$2,202 90		$1,967 00	$279 00			12.7
	*B-9	S. R.	58.301	162,183 61		2,782 00	29,151 00		$1,485 00	18.9
	D-16	T. L.	1.023	11,369 29		11,114 00	3,172 00			27.9
	E-9	S. R.	2.647	15,220 25		5,750 00	2,647 00			17.4
	E-9—E-16	T. L.	.440	1,533 16	$1,269 80	6,370 00	440 00	$1,056 00		11.7
	E-16	T. L.	1.231	8,221 34		6,679 00	4,186 00			50.9
Total			64.762	$200,730 55	$1,269 80		$39,875 00	$1,056 00	$1,485 00	
Marquette	C-14	T. L.	1.424	$4,827 36		$3,390 00	$3,204 00			66.2
	C-16	T. L.	.500	4,017 40		8,035 00	1,275 00			31.7
	*E-9	S. R.	12.040	82,509 01		6,853 00	12,040 00		$5,784 00	21.6
	*E-12	S. R.	.422	1,658 46		3,930 00	549 00			33.1
	E-14	T. L.	.587	3,632 27		6,188 00	1,760 00			48.5
	E-15	S. R.	1.254	11,894 28		9,485 00	2,006 00			16.9
	E-16	S. R.	.164	1,613 02		9,835 00	279 00			17.3
Total			16.391	$110,151 80			$21,113 00		$5,784 00	
Mason	A-9	S. R.	1.500	$1,966 86		$1,311 00	$375 00			19.1
	B-9	S. R.	46.351	103,925 27		2,242 00	23,175 00		$250 00	22.3
	D-9	S. R.	.500	1,256 25		2,513 00	375 00			29.9
	E-9	S. R.	13.972	52,448 55		3,754 00	13,972 00		450 00	27.5
Total			62.323	$159,596 93			$37,897 00		$700 00	
Mecosta	B-9	S. R.	68.344	$134,451 48		$1,967 00	$34,172 00		$499 00	25.8
	B-15	T. L.	1.976	9,191 90		4,652 00	3,162 00			34.4
Total			70.320	$143,643 38			$37,334 00		$499 00	
Menominee	A-16	T. L.	1.002	$1,987 82		$1,984 00	$852 00			42.8
	B-9	S. R.	19.488	23,897 98		1,226 00	9,744 00			70.1
	C-9	S. R.	8.800	23,487 61		2,669 00	6,600 00			28.0
	C-16	T. L.	6.058	27,715 34		4,575 00	15,448 00			55.7
	E-9	S. R.	7.393	21,401 45		2,895 00	7,393 00			34.5
	E-16	T. L.	1.000	4,156 38		4,156 00	3,400 00			81.8
Total			43.741	$102,646 58			$43,437 00			
Midland	A-9	S. R.	1.000	$943 50		$944 00	$250 00			26.4
	B-9	S. R.	5.460	9,080 98		1,663 00	2,730 00			30.0
	C-9	S. R.	3.486	14,013 79		4,020 00	2,615 00			18.7
	E-9	S. R.	3.004	16,953 99		5,644 00	3,004 00			17.7
	E-9	T. L.	2.972	12,796 00		4,306 00	5,944 00			46.5
Total			15.922	$53,788 26			$14,543 00			

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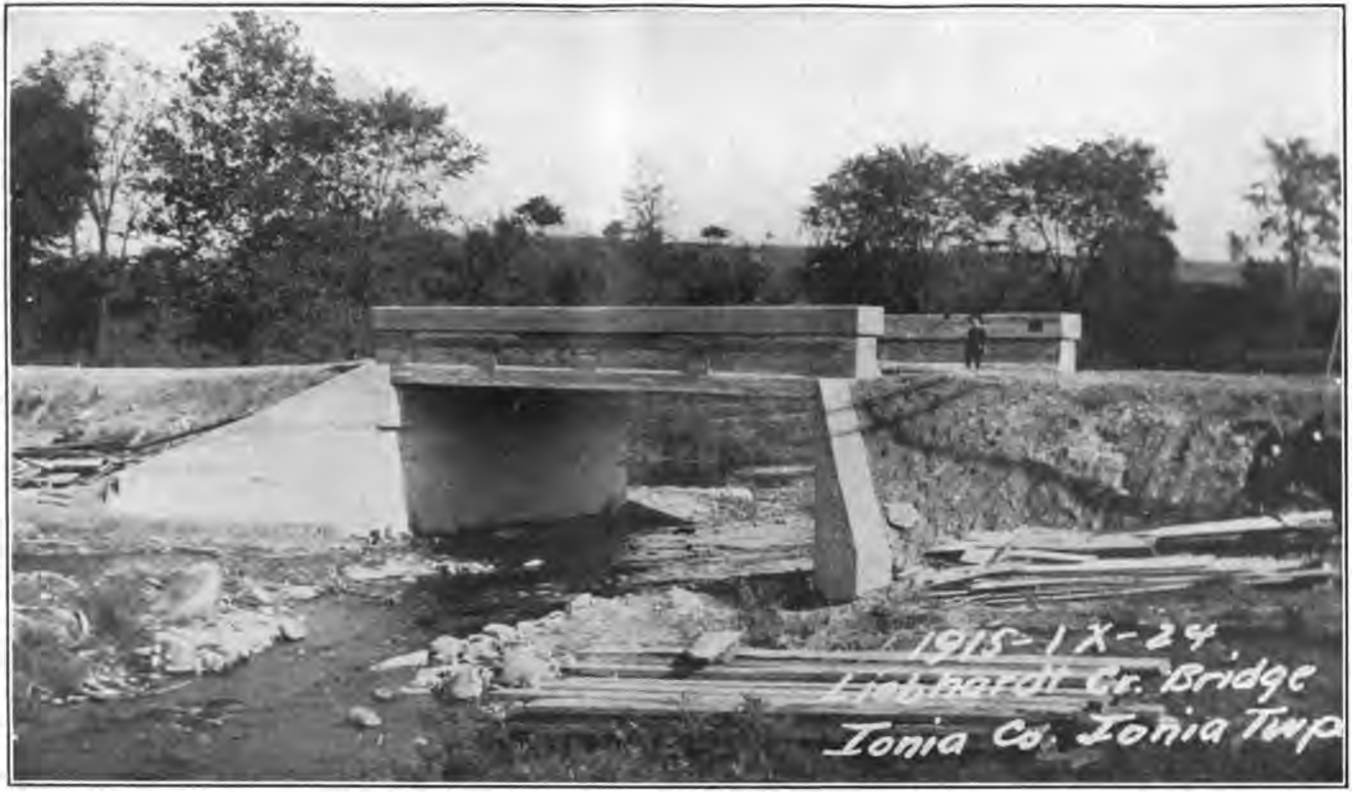
*Rewarded as 9 ft. wide, but built 14-16 ft. wide before extra state reward was allowed on wider roads.

TABLE NO. 18.—CONTINUED.

County.	Class and width.	Miles.	Cost.		Average cost per mile.	Reward.		Paid 50 per cent additional.	Per cent cost paid by State.
			Original.	Rebuilt.		Original.	Rebuilt.		
Missaukee	B-9 S. R.	21.526	$45,765 05		$2,126 00	$10,763 00			23.5
	C-9 S. R.	10.253	32,549 60		3,175 00	7,690 00			23.6
	D-9 S. R.	.171	410 40		2,400 00	129 00			31.4
	E-9 S. R.	1.935	6,192 60		3,200 00	1,935 00			31.2
Total		33.885	$84,917 65			$20,517 00			
Monroe	C-10 S. R.	1.000	$4,148 21		$4,148 00	$825 00			19.9
	E-9 S. R.	25.383	105,236 10		4,146 00	25,383 00			24.1
	E-14 S. R.	7.000	28,854 88		4,122 00	10,500 00			36.4
	E-15 S. R.	4.000	26,800 00		6,700 00	6,400 00			23.9
Total		37.383	$165,239 19			$43,108 00			
Montcalm	A-9 S. R.	3.089	$5,555 53		$1,798 00	$772 00			13.9
	B-9 S. R.	72.996	130,759 94		1,791 00	36,498 00			27.9
	B-10 S. R.	1.552	2,283 50		1,471 00	854 00			37.6
Total		77.637	$138,598 97			$38,124 00			
Muskegon	A-9 S. R.	3.034	$7,311 26		$2,410 00	$759 00			10.3
	B-9 S. R.	18.354	67,731 17		3,690 00	9,178 00		$633 00	14.5
	B-16 T. L.	.663	6,636 26		10,009 00	1,128 00			16.9
	C-9 S. R.	.931	6,352 54		6,824 00	698 00			10.9
	E-9 S. R.	39.120	166,134 79		4,244 00	39,120 00			23.6
	E-9 T. L.	2.217	21,257 39	$2,808 57	10,855 00	4,434 00	$1,320 00	8,681 00	59.9
	E-16 T. L.	1.847	15,804 88		8,558 00	6,280 00			39 7
Total		66.166	$291,228 29	$2,808 57		$61,597 00	$1,320 00	$9,314 00	
Newaygo	B-9 S. R.	30.621	$63,193 17		$2,064 00	$15,311 00			24.2
	B-9 T. L.	1.250	6,200 42		4,960 00	1,250 00		$126 00	22.2
	B-10 S. R.	.759	2,110 10		2,780 00	417 00			19.8
	B-12 T. L.	5.992	13,065 75		2,181 00	7,790 00			59.6
	C-10 S. R.	.307	1,096 76		3,573 00	253 00			23.1
	E-9 S. R.	8.745	40,218 80		4,599 00	8,745 00			21.8
Total		47.674	$125,885 00			$33,766 00		$126 00	



Reinforced concrete girder bridge on the Ionia-Lyons road. Built by the State Highway Department.

Oakland	B-9	S. R.	28.909	$70,561 14		$2,441 00	$14,455 00		$641 00	21.4
	B-11	S. R.	.870	2,139 15		2,459 00	522 00			24.4
	B-16	T. L.	3.088	17,807 90		5,764 00	5,250 00			29.5
	C-9	S. R.	1.000	4,528 46		4,528 00	750 00			16.6
	C-11	S. R.	2.004	9,715 35		4,848 00	1,804 00			18.6
	D-9—D-16	T. L.	1.000	10,470 93		10,471 00	750 00	$1,800 00		24.4
	D-16	T. L.	1.107	6,684 50		6,038 00	2,822 00			42.2
	E-9	S. R.	2.004	6,569 40		3,278 00	2,004 00			30.5
	F-15	T. L.	.123	815 50		6,630 00	394 00			48.3
Total			40.105	$129,292 33			$28,751 00	$1,800 00	$641 00	
Oceana	B-9	S. R.	15.052	$28,954 04		$1,924 00	$7,526 00			26.0
	E-9	S. R.	51.416	200,272 00		3,895 00	53,666 00		$1,990 00	27.8
Total			66.468	$228,226 04			$61,192 00		$1,990 00	
Ogemaw	B-9	S. R.	7.558	$18,694 79		$2,474 00	$3,779 00			20.2
	B-12	T. L.	.993	3,188 95		3,211 00	1,290 00			40.5
Total			8.551	$21,883 74			$5,069 00			
Ontonagon	A-9	S. R.	4.000	$5,788 50		$1,447 00	$1,000 00			17.3
	E-9	S. R.	3.566	17,128 00		4,803 00	3,566 00			20.8
	E-9	T. L.	5.000	23,188 67		4,638 00	10,000 00			43.2
Total			12.566	$46,105 17			$14,566 00			
Osceola	B-9	S. R.	29.775	$56,380 47		$1,894 00	$14,888 00		$375 00	27.1
	C-9	S. R.	1.126	2,974 72		2,642 00	844 00			28.4
	D-9	S. R.	.556	1,606 84		2,890 00	417 00			26.0
	E-9	S. R.	5.474	18,150 63		3,316 00	5,474 00			30.2
Total			36.931	$79,112 66			$21,623 00		$375 00	
Ottawa	B-9	S. R.	6.116	$14,914 00		$2,439 00	$3,058 00			20.4
	B-12	S. R.	4.953	19,413 30		3,920 00	3,219 00			16.6
	B-16	T. L.	2.886	13,904 31		4,818 00	4,906 00			35.3
	E-12	S. R.	1.000	5,779 00		5,779 00	1,300 00			22.4
Total			14.955	$54,011 18			$12,483 00			
Presque Isle	B-9	S. R.	2.024	$2,824 98		$1,396 00	$1,012 00			35.8
	B-16	S. R.	1.866	3,541 00		1,898 00	1,586 00			44.7
Total			3.890	$6,365 98			$2,598 00			
Roscommon	B-9	S. R.	4.490	$9,390 36		$2,091 00	$2,245 00			23.9
Total			4.490	$9,390 36		$2,091 00	$2,245 00			

TABLE NO. 18.—CONCLUDED.

County.	Class and width.	Miles.	Cost.		Average cost per mile.	Reward.		Paid 50 per cent additional.	Per cent cost paid by State.
			Original.	Rebuilt.		Original.	Rebuilt.		
Saginaw	A-9 S. R.	2.032	$4,057 00		$1,997 00	$508 00			12.5
	B-9 S. R.	6.321	19,980 57		3,163 00	3,161 00			15.8
	C-9 S. R.	1.522	6,001 75		3,943 00	1,142 00			19.0
	E-9 S. R.	128.576	666,568 85	$5,184 00	5,184 00	128,576 00		$4,631 00	20.0
	E-16 T. L.	1.062	8,324 33		7,838 00	5,266 00			43.3
	F-9 S. R.	1.088	6,230 07		5,726 00	1,088 00			17.5
Total		140.601	$711,162 57	$5,184 00		$139,741 00		$4,631 00	
Sanilac	B-9 S. R.	23.439	$52,523 44		$2,241 00	$11,719 00			22.3
	B-15 T. L.	1.000	4,095 00		4,095 00	1,600 00			39.1
	E-9 S. R.	8.002	27,802 98		3,475 00	8,002 00			45.0
	E-15 T. L.	2.000	13,904 16		6,952 00	6,400 00			46.0
Total		24.441	$98,325 58			$27,721 00			
Schoolcraft	E-9 S. R.	9.226	$46,067 35		$4,993 00	$9,226 00		$1,520 00	23.3
	E-12 S. R.	2.764	12,778 00		4,623 00	7,186 00			56.2
Total		11.990	$58,845 35			$16,412 00		$1,520 00	
Shiawassee	A-9 S. R.	3.384	$2,963 67		$876 00	$846 00			28.5
	B-9 S. R.	48.464	102,368 30		2,112 00	24,232 00			23.7
	B-10 S. R.	1.534	3,195 72		2,083 00	845 00			26.4
	B-16 T. L.	3.946	11,423 09		2,895 00	6,708 00			55.7
Total		57.328	$119,950 78			$32,631 00			
St. Clair	B-9 S. R.	4.754	$7,653 48		$1,610 00	$2,377 00			31.0
	B-16 T. L.	.567	2,528 32		4,459 00	964 00			38.1
	E-9 S. R.	16.720	74,297 94		4,444 00	16,720 00			22.5
	E-9—E-16 T. L.	2.032	10,687 00	$10,753 26	10,551 00	2,032 00	$4,181 00		58.1
	E-16 T. L.	2.936	18,918 71		6,444 00	9,782 00			51.8
	F-9 S. R.	.506	3,424 17		6,767 00	506 00			14.7
Total		27.515	$117,509 62	$10,753 26		$32,381 00	$4,181 00		
St. Joseph	A-9 S. R.	2.004	$3,119 70		$1,557 00	$501 00			16.1
	B-9 S. R.	11.756	30,327 83		2,580 00	5,878 00			19.4
	B-16 S. R.	.500	1,776 02		3,552 00	425 00			23.9
	C-9 S. R.	1.894	7,099 09		3,748 00	1,421 00			20.0
	E-9 S. R.	1.655	8,496 77		5,134 00	1,655 00			19.5
	E-16 T. L.	.315	2,686 77		8,529 00	1,070 00			39.8
Total		18.124	$53,506 18			$10,950 00			

Tuscola	• B-9	S. R.	85.752	$175,291 76		$2,044 00	$42,876 00		$748 00	24.4
	B-16	S. R.	.500	1,126 30		2,253 00	425 00			37.9
	C-9	S. R.	.999	4,608 08		4,613 00	749 00			37.7
	C-13	S. R.	1.000	3,888 77		3,889 00	1,050 00			27.0
	C-16	T. L.	1.000	6,077 19		6,077 00	2,550 00			42.0
	E-9	S. R.	1.750	10,875 44		6,215 00	1,750 00			25.2
	E-16	T. L.	2.000	14,814 34		7,407 00	6,800 00			45.9
Total			93.001	$216,681 88			$56,200 00		$748 00	
Van Buren	A-9	S. R.	2.295	$1,902 08		$829 00	$574 00			30.2
	B-9	S. R.	17.929	37,656 48		2,100 00	8,964 00			23.8
	B-16	S. R.	.124	182 28		1,470 00	105 00			57.7
	B-16	T. L.	2.000	7,886 25		3,943 00	3,400 00			43.1
	C-16	T. L.	1.000	2,756 97		2,757 00	2,550 00			92.5
	A-9—E-9	S. R.	.250	1,780 71	$1,000 75	11,126 00	62 00	$187 00		8.9
	E-9	S. R.	7.832	41,589 23		5,311 00	7,832 00		$250 00	19.4
	E-16	T. L.	2.146	17,053 47		7,947 00	7,296 00			42.7
Total			33.576	$110,807 47	$1,000 75		$30,783 00	$187 00	$250 00	
Washtenaw	B-9	S. R.	5.970	$14,837 35		$2,485 00	$2,985 00			20.1
	B-12	S. R.	7.327	20,089 21		2,742 00	4,763 00			23.7
	B-16	T. L.	2.484	9,480 00		3,816 00	4,222 00			44.5
	C-12	S. R.	2.046	7,786 05		3,806 00	1,995 00			25.6
Total			17.827	$52,192 61			$13,965 00			
Wayne	B-9	S. R.	13.120	$50,167 28		$3,824 00	$6,560 00			13.1
	C-9	S. R.	.492	2,891 46		5,877 00	369 00			12.7
	C-12	S. R.	10.419	84,286 75		8,090 00	10,160 00			12.1
	*E-9	S. R.	8.892	85,026 13		9,562 00	8,892 00			10.4
	*F-9	S. R.	49.804	717,230 71		14,401 00	49,804 00		$16,183 00	9.2
	F-12	S. R.	15.604	192,319 69		12,325 00	20,285 00			10.6
	F-15	S. R.	15.069	387,905 88		15,926 00	24,110 00			14.2
	F-15	T. L.	3.532				11,302 00			
	F-16	T. L.	5.756				19,572 00			
	E-9—F-16	T. L.	.988	12,517 96	17,775 99	30,662 00	988 00	2,315 00		26.3
	E-9—G-16	T. L.	.104	2,584 40	5,104 57	73,932 00	104 00	250 00		13.7
Total			123.780	$1,534,930 26	$22,880 56		$152,146 00	$2,565 00	$16,183 00	
Wexford	B-9	S. R.	56.691	$143,752 85		$2,536 00	$28,345 00		$878 00	19.9
	B-15	T. L.	.751	2,545 93		3,390 00	1,201 00			47.2
	C-9	S. R.	7.887	20,366 56		2,582 00	5,915 00		747 00	29.0
	C-14	T. L.	1.111	4,285 25		3,857 00	2,500 00			58.3
	C-15	T. L.	.500	1,941 20		3,882 00	1,200 00			61.9
	D-9	S. R.	3.014	8,060 67		2,674 00	2,261 00			28.0
	E-9	S. R.	2.015	8,404 35		4,171 00	2,015 00		1,007 00	23.9
Total			71.969	$189,356 81			$43,437 00		$2,632 00	

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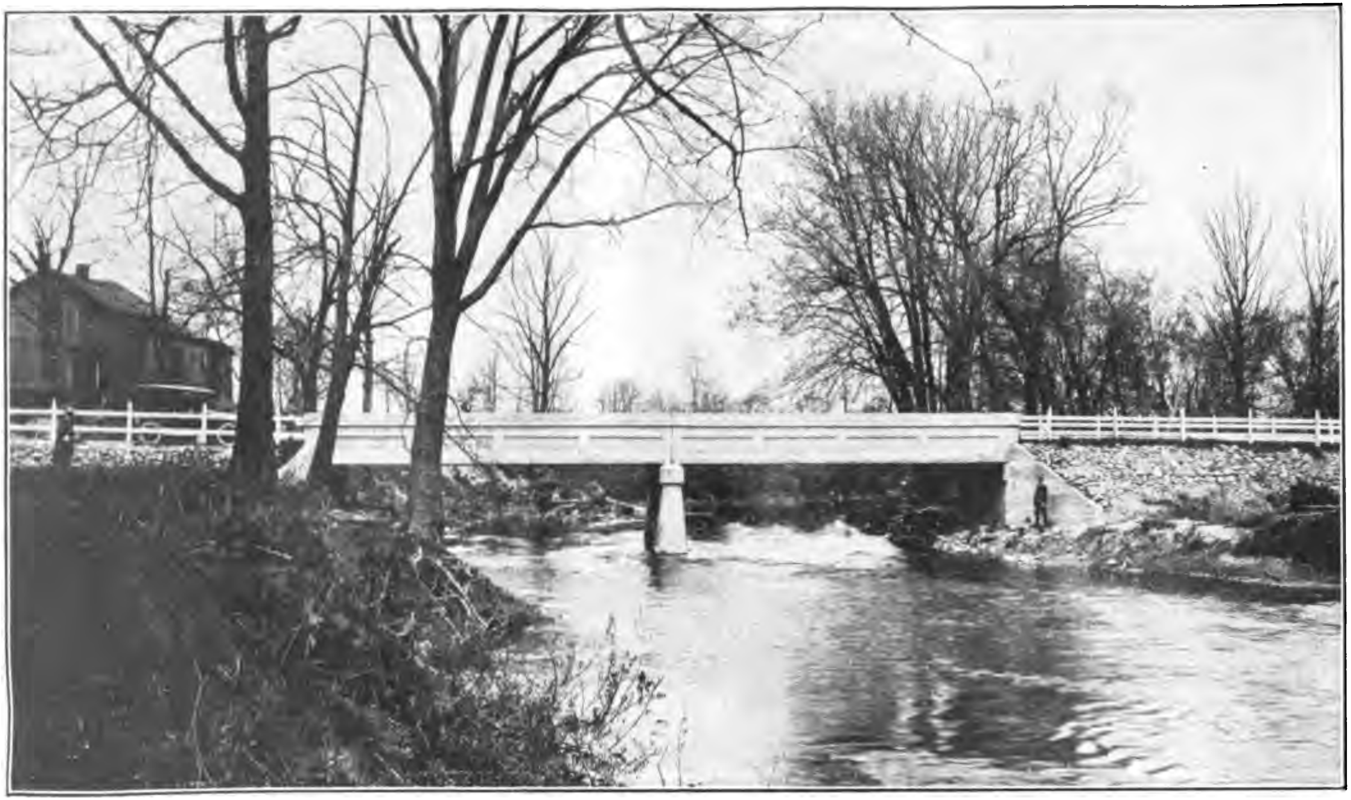
*Rewarded as 9 ft. wide, but built 14-16 ft. wide before extra state reward was allowed on wider roads.

TABLE NO. 19.—*Cost of roads, average cost per mile, and ratio of reward to cost by classes and widths for 1916 (supplementary to Table No. 18).*

County.	Class and width.	Miles.	Cost.		Average cost per mile.	Reward.		Paid 50 per cent additional.	Per cent cost paid by State.
			Original.	Rebuilt.		Original.	Rebuilt.		
Alger	A-14 S. R.	1.250	$1,029 00		$823 00	$469 00			45.6
	E-14 S. R.	.500	2,749 00		5,500 00	750 00			27.3
	E-14 T. L.	4.553	17,634 38		3,880 00	13,660 00			77.4
Total		6.303	$21,412 38			$14,879 00			
Allegan	B-9 S. R.	1.726	$5,582 95		$3,092 00	$863 00			17.9
	B-10 S. R.	4.440	15,646 60		3,525 00	2,428 00			15.5
	B-12 S. R.	.648	1,490 60		4,350 00	421 00			18.3
	E-9 S. R.	1.732	11,052 31		6,380 00	1,732 00			15.7
Total		8.546	$33,772 46			$5,444 00			
Antrim	B-9 S. R.	5.034	$23,204 84		$4,585 00	$2,517 00			10.9
	B-9—B-14 T. L.	1.960	4,190 90	$3,365 16	3,850 00	980 00	$1,962 00		37.6
	B-14 T. L.	2.000	5,992 95		2,995 00	3,000 00			50.0
Total		8.994	$33,388 69	$3,365 16		$6,497 00	$1,962 00		
Arenac	C-9 S. R.	2.250	$6,763 00		$3,005 00	$1,688 00			25.0
Total		2.250	$6,763 00			$1,688 00			
Barry	B-9 S. R.	1.064	$1,687 00		$1,677 00	$532 00			31.5
Total		1.064	$1,687 00			$532 00			
Bay	C-9 S. R.	2.553	$6,992 50		$1,735 00	$1,915 00			17.4
	E-9 S. R.	3.472	11,517 95		3,315 00	3,472 00			30.2
	E-9 T. L.	1.000	3,060 00		3,060 00	2,000 00			65.3
	E-9—F-16 T. L.	.500	1,892 00	$5,103 53	13,991 00	500 00	$1,200 00		12.2
Total		7.525	$23,462 45	$5,103 53		$7,887 00	$1,200 00		
Benzie	B-9 S. R.	4.084	$7,552 84		$1,852 00	$2,042 00			27.0
	B-12 S. R.	1.046	3,245 97		3,103 00	681 00			21.0
	B-12 T. L.	1.000	2,226 27		2,226 00	1,300 00			58.4
	B-9—B-15 T. L.	.500	638 64	$445 80	2,168 00	250 00	$550 00		73.8
	B-15 T. L.	1.000	3,746 43		3,746 00	1,600 00			42.7
Total		7.630	$17,410 15	$445 80		$5,873 00	$550 00		



Two span reinforced concrete girder bridge built by the State Highway Department over the Red Cedar river nine miles east of Lansing on the Detroit road.

Berrien		B-12	T. L.	.502	$2,203 53		$4,540 00	$652 00			
		E-9	S. R.	—.607	—3,475 31			—607 00			18.4
		E-10	S. R.	.189	963 50		5,090 00	208 00			
		E-12	S. R.	7.773	62,120 26		8,035 00	10,105 00			21.6
		E-16	T. L.	2.083	16,114 84		7,730 00	7,082 00			
	[illegible]	[illegible]	T. L.	1.360	6,123 00	$7,500 00	10,000 00	[illegible]			[illegible]

Berrien	B-12 T. L.	.502	$2,293 53		$4,540 00	$652 00			18.4
	E-9 S. R.	—.607	—3,475 31			—607 00			
	E-10 S. R.	.189	963 50		5,090 00	208 00			21.6
	E-12 S. R.	7.773	62,120 26		8,035 00	10,105 00			16.3
	E-16 T. L.	2.083	16,114 84		7,730 00	7,082 00			44.0
	E-9—E-16 T. L.	1.360	6,123 00	$7,500 00	10,000 00	1,360 00	$952 00		17.0
Total		11.300	$84,139 82	$7,500 00		$18,800 00	$952 00		
Branch	B-9 S. R.	4.112	$9,159 58		$2,228 00	$2,056 00			28.0
	C-16 T. L.	1.506	6,886 22		4,575 00	3,840 00			55.8
	E-16 T. L.	1.042	8,131 29		7,710 00	3,542 00			43.6
Total		6.660	$24,177 09			$9,438 00			
Calhoun	B-9 S. R.	12,092	$32,462 59		$2,685 00	$6,046 00			18.8
	B-9—B-16 T. L.	.500	1,250 00	$1,795 00	6,090 00	250 00	$600 00		68.0
	B-16 S. R.	1.636	4,123 30		2,520 00	1,391 00			33.7
	B-16 T. L.	2.315	12,847 00		5,550 00	3,936 00			30.6
	C-9 S. R.	10.605	33,668 92		3,175 00	7,953 00			23.7
	C-16 T. L.	1.460	10,542 54		7,220 00	3,724 00			35.4
Total		28.608	$94,894 35	$1,795 00		$23,300 00	$600 00		
Cass	B-9 S. R.	9.000	$22,712 86		$2,543 00	$4,500 00			19.8
Total		9.000	$22,712 86			$4,500 00			
Charlevoix	B-9 S. R.	7.061	$23,399 58		$3,300 00	$3,531 00			15.1
	B-15 T. L.	.246	1,641 40		6,670 00	394 00			24.0
	C-15 T. L.	.606	1,780 25		2,940 00	1,454 00			81.7
	E-9 S. R.	1.200	3,970 15		3,310 00	1,200 00			30.2
	E-15 T. L.	1.023	6,805 56		6,650 00	3,274 00			48.1
Total		10.136	$37,596 94			$9,853 00			
Cheboygan	B-10 S. R.	.502	$808 86		$1,610 00	$276 00			34.2
	E-9 S. R.	.632	2,720 55		4,290 00	632 00			23.3
	E-10 T. L.	2.000	9,719 00		1,859 00	4,400 00			45.3
	E-14 S. R.	.322	1,996 54		6,200 00	483 00			24.2
	E-14 T. L.	1.987	8,337 29		4,195 00	4,766 00			57.2
	E-15 T. L.	2.747	14,448 00		5,260 00	8,676 00			60.0
Total		8.190	$38,030 24			$19,233 00			
Clare	B-9 S. R.	4.750	$9,154 53		$1,925 00	$2,375 00			26.0
	B-12 T. L.	3.251	8,870 95		1,730 00	4,226 00			37.5
	B-15 T. L.	.501	1,765 04		3,530 00	802 00			45.4
Total		8.502	$19,790 52			$7,403 00			

TABLE NO. 19.—CONTINUED.

County.	Class and width.	Miles.	Cost.		Average cost per mile.	Reward.		Paid 50 per cent additional.	Per cent cost paid by State.
			Original.	Rebuilt.		Original.	Rebuilt.		
Clinton	B-9 S. R.	9.252	$29,618 77		$3,208 00	$4,626 00			15.6
	B-16 T. L.	.500	1,495 80		2,991 00	850 00			56.8
	C-9 S. R.	1.756	5,746 96		3,280 00	1,318 00			23.0
Total		11.508	$36,861 53			$6,794 00			
Crawford	B-9 S. R.	1.014	$3,147 90		$3,100 00	$507 00			16.1
Total		1.014	$3,147 90			$507 00			
Delta	E-9 S. R.	—7.004	—$29,046 47			—$7,004 00			
	E-16 S. R.	.784	3,082 26		$3,960 00	1,333 00			43.3
	E-9—E-16 T. L.	9.376	38,252 65	$22,372 40	6,470 00	9,376 00	$22,503 00		83.3
	E-16 T. L.	5.846	35,941 21		6,140 00	19,874 00			55.3
Total		9.002	$48,229 65	$22,372 40		$23,579 00	$22,503 00		
Dickinson	A-9 T. L.	5.000	$12,801 68		$2,560 00	$2,500 00			19.5
	B-16 T. L.	.315	650 49		2,065 00	536 00			82.4
	E-9—C-16 T. L.	(—)2.081	(—)10,183 62	$6,917 87	8,220 00	(—)2,081 00	$2,130 00		24.6
Total		5.315	$13,452 17	$6,917 87		$3,036 00	$2,130 00		
Eaton	B-9 S. R.	9.812	$21,353 79		$2,295 00	$4,906 00			23.0
	B-16 S. R.	3.122	10,245 56		3,280 00	2,654 00			25.9
Total		12.934	$31,599 35			$7,560 00			
Emmet	B-15 S. R.	.120	$529 45		$4,320 00	$96 00			18.1
	B-15 T. L.	1.612	4,967 85		3,040 00	2,580 00			52.0
	E-9 S. R.	1.214	5,525 00		4,550 00	1,214 00			21.8
	E-15 T. L.	1.246	7,395 81		5,935 00	3,988 00			53.9
Total		4.192	$18,418 11			$7,878 00			
Genesee	B-9 S. R.	26.700	$74,648 18		$2,815 00	$13,350 00			17.9
	C-9 S. R.	.995	3,231 72		3,245 00	746 00			23.1
Total		27.695	$77,879 90			$14,096 00			

Grand Traverse	B-9 S. R.	1.008	$1,125 94		$1,116 00	$504 00			44.8
	B-12 S. R.	2.433	8,864 02		3,630 00	1,581 00			17.8
	B-9—B-12 T. L.	.500	2,131 75	$1,625 43	7,514 00	250 00	$400 00		17.3
	B-14 S. R.	.856	2,141 04		2,500 00	641 00			29.9
	B-14 T. L.	1.826	6,577 68		3,600 00	2,738 00			41.6
	E-10 S. R.	.511	2,292 36		4,485 00	563 00			24.6
	D-10 S. R.	.994	4,576 00		4,575 00	820 00			19.9
Total		8.128	$27,708 79	$1,625 43		$7,097 00	$400 00		
Gratiot	A 9 S. R.	4.866	$4,750 44		$976 00	$1,215 00			25.5
	B-9 S. R.	3.524	7,785 44		2,215 00	1,762 00			22.6
Total		8.390	$12,535 88			$2,977 00			
Hillsdale	B-9 S. R.	7.112	$20,454 86		$2,875 00	$3,556 00		+$156 00	17.4
	E-9 S. R.	6.643	15,938 89		2,400 00	6,643 00		+416 00	41.7
	E-16 T. L.	1.250	7,309 14		5,850 00	4,250 00			58.2
Total		15.005	$43,702 89			$14,449 00		+$572 00	
Houghton	E-9—E-15 T. L.	(—)1.061	(—)$6,936 71	$654 15	$7,160 00	(—)$1,061 00	$1,805 00		37.8
	E-15 T. L.	3.521	21,113 00		6,000 00	11,268 00			53.4
	E-16 T. L.	.681	9,840 00		15,600 00	2,316 00			23.5
Total		4.202	$30,953 00	$654 15		$13,584 00	$1,805 00		
Huron	B-9 S. R.	22.296	$49,754 33		$2,223 00	$11,148 00			22.4
	B-15 T. L.	2.000	6,620 00		3,310 00	3,200 00			48.4
	B-16 S. R.	.124	692 65		5,580 00	105 00			15.2
	C-9 S. R.	1.000	5,400 56		5,400 00	750 00			13.9
	E-9 S. R.	1.132	4,326 37		3,820 00	1,132 00			26.2
Total		26.552	$66,793 91			$16,335 00			
Ingham	B-9 S. R.	8.380	$27,389 35		$3,265 00	$4,190 00		+$545 00	15.3
	B-16 T. L.	5.063	45,605 82		9,010 00	8,608 00			18.9
Total		13.443	$72,995 17			$12,798 00		+$545 00	
Ionia	B-9 S. R.	3.674	$6,377 07		$1,736 00	$1,837 00			28.9
	B-16 S. R.	1.004	3,245 00		3,120 00	853 00			26.3
	B-16 T. L.	7.120	23,509 08		3,313 00	10,921 00			46.4
Total		11.798	$33,131 15			$13,611 00			
Iosco	A-9 S. R.	1.000	$2,169 11		$2,169 00	$250 00			11.5
	A-12 T. L.	2.028	1,443 47		712 00	1,318 00			91.3
	B-9 S. R.	2.018	7,776 04		3,835 00	1,009 00			13.0
	B-12 T. L.	1.507	7,684 46		5,100 00	1,960 00			25.5
Total		6.553	$19,073 08			$4,537 00			

Oakland	B-9	S. R.	28.909	$70,561 14		$2,441 00	$14,455 00		$641 00	21.4
	B-11	S. R.	.870	2,139 15		2,459 00	522 00			24.4
	B-16	T. L.	3.088	17,807 90		5,764 00	5,250 00			29.5
	C-9	S. R.	1.000	4,528 46		4,528 00	750 00			16.6
	C-11	S. R.	2.004	9,715 35		4,848 00	1,804 00			18.6
	D-9—D-16	T. L.	1.000	10,470 93		10,471 00	750 00	$1,800 00		24.4
	D-16	T. L.	1.107	6,684 50		6,038 00	2,822 00			42.2
	E-9	S. R.	2.004	6,569 40		3,278 00	2,004 00			30.5
	F-15	T. L.	.123	815 50		6,630 00	394 00			48.3
Total			40.105	$129,292 33			$28,751 00	$1,800 00	$641 00	
Oceana	B-9	S. R.	15.052	$28,954 04		$1,924 00	$7,526 00			26.0
	E-9	S. R.	51.416	200,272 00		3,895 00	53,666 00		$1,990 00	27.8
Total			66.468	$228,226 04			$61,192 00		$1,990 00	
Ogemaw	B-9	S. R.	7.558	$18,694 79		$2,474 00	$3,779 00			20.2
	B-12	T. L.	.993	3,188 95		3,211 00	1,290 00			40.5
Total			8.551	$21,883 74			$5,069 00			
Ontonagon	A-9	S. R.	4.000	$5,788 50		$1,447 00	$1,000 00			17.3
	E-9	S. R.	3.566	17,128 00		4,803 00	3,566 00			20.8
	E-9	T. L.	5.000	23,188 67		4,638 00	10,000 00			43.2
Total			12.566	$46,105 17			$14,566 00			
Osceola	B-9	S. R.	29.775	$56,380 47		$1,894 00	$14,888 00		$375 00	27.1
	C-9	S. R.	1.126	2,974 72		2,642 00	844 00			28.4
	D-9	S. R.	.556	1,606 84		2,890 00	417 00			26.0
	E-9	S. R.	5.474	18,150 63		3,316 00	5,474 00			30.2
Total			36.931	$79,112 66			$21,623 00		$375 00	
Ottawa	B-9	S. R.	6.116	$14,914 00		$2,439 00	$3,058 00			20.4
	B-12	S. R.	4.953	19,413 30		3,920 00	3,219 00			16.6
	B-16	T. L.	2.886	13,904 31		4,818 00	4,906 00			35.3
	E-12	S. R.	1.000	5,779 00		5,779 00	1,300 00			22.4
Total			14.955	$54,011 18			$12,483 00			
Presque Isle	B-9	S. R.	2.024	$2,824 98		$1,396 00	$1,012 00			35.8
	B-16	S. R.	1.866	3,541 00		1,898 00	1,586 00			44.7
Total			3.890	$6,365 98			$2,598 00			
Roscommon	B-9	S. R.	4.490	$9,390 36		$2,091 00	$2,245 00			23.9
Total			4.490	$9,390 36		$2,091 00	$2,245 00			

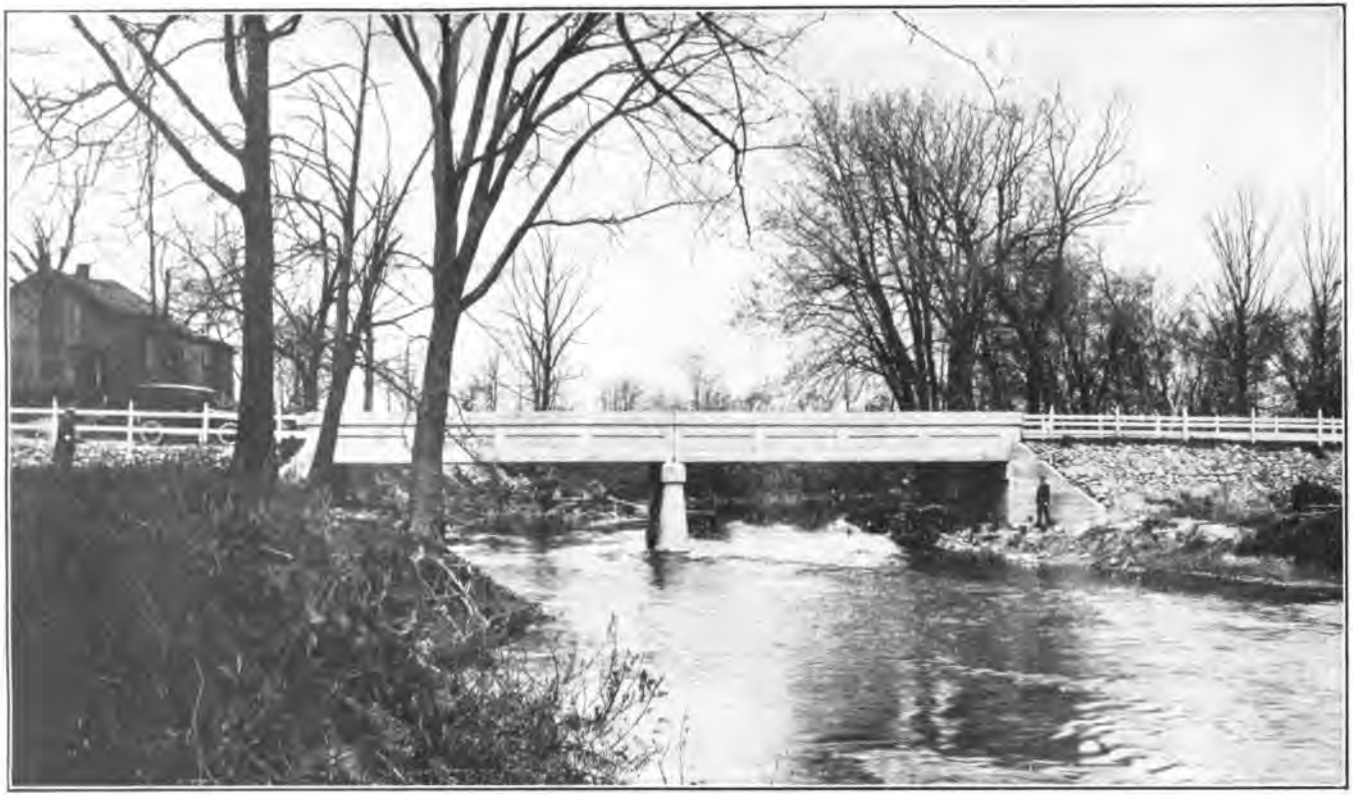
TABLE NO. 18.—CONCLUDED.

County.	Class and width.	Miles.	Cost.		Average cost per mile.	Reward.		Paid 50 per cent additional.	Per cent cost paid by State.
			Original.	Rebuilt.		Original.	Rebuilt.		
Saginaw	A-9 S. R.	2.032	$4,057 00		$1,997 00	$508 00			12.5
	B-9 S. R.	6.321	19,980 57		3,163 00	3,161 00			15.8
	C-9 S. R.	1.522	6,001 75		3,943 00	1,142 00			19.0
	E-9 S. R.	128.576	666,568 85	$5,184 00	5,184 00	128,576 00		$4,631 00	20.0
	E-16 T. L.	1.062	8,324 33		7,838 00	5,266 00			43.3
	F-9 S. R.	1.088	6,230 07		5,726 00	1,088 00			17.5
Total		140.601	$711,162 57	$5,184 00		$139,741 00		$4,631 00	
Sanilac	B-9 S. R.	23.439	$52,523 44		$2,241 00	$11,719 00			22.3
	B-15 T. L.	1.000	4,095 00		4,095 00	1,600 00			39.1
	E-9 S. R.	8.002	27,802 98		3.475 00	8,002 00			45.0
	E-15 T. L.	2.000	13,904 16		6,952 00	6,400 00			46.0
Total		24.441	$98,325 58			$27,721 00			
Schoolcraft	E-9 S. R.	9.226	$46,067 35		$4,993 00	$9,226 00		$1,520 00	23.3
	E-12 S. R.	2.764	12,778 00		4,623 00	7,186 00			56.2
Total		11.990	$58,845 35			$16,412 00		$1,520 00	
Shiawassee	A-9 S. R.	3.384	$2,963 67		$876 00	$846 00			28.5
	B-9 S. R.	48.464	102,368 30		2,112 00	24,232 00			23.7
	B-10 S. R.	1.534	3,195 72		2,083 00	845 00			26.4
	B-16 T. L.	3.946	11,423 09		2,895 00	6,708 00			55.7
Total		57.328	$119,950 78			$32,631 00			
St. Clair	B-9 S. R.	4.754	$7,653 48		$1,610 00	$2,377 00			31.0
	B-16 T. L.	.567	2,528 32		4,459 00	964 00			38.1
	E-9 S. R.	16.720	74,297 94		4,444 00	16,720 00			22.5
	E-9—E-16 T. L.	2.032	10,687 00	$10,753 26	10,551 00	2,032 00	$4,181 00		58.1
	E-16 T. L.	2.936	18,918 71		6,444 00	9,782 00			51.8
	F-9 S. R.	.506	3,424 17		6,767 00	506 00			14.7
Total		27.515	$117,509 62	$10,753 26		$32,381 00	$4,181 00		
St. Joseph	A-9 S. R.	2.004	$3,119 70		$1,557 00	$501 00			16.1
	B-9 S. R.	11.756	30,327 83		2,580 00	5,878 00			19.4
	B-16 S. R.	.500	1,776 02		3,552 00	425 00			23.9
	C-9 S. R.	1.894	7,099 09		3,748 00	1,421 00			20.0
	E-9 S. R.	1.655	8,496 77		5,134 00	1,655 00			19.5
	E-16 T. L.	.315	2,686 77		8,529 00	1,070 00			39.8
Total		18.124	$53,506 18			$10,950 00			

Oakland	B-9	S. R.	28.909	$70,561 14		$2,441 00	$14,455 00		$641 00	21.4
	B-11	S. R.	.870	2,139 15		2,459 00	522 00			24.4
	B-16	T. L.	3.088	17,807 90		5,764 00	5,250 00			29.5
	C-9	S. R.	1.000	4,528 46		4,528 00	750 00			16.6
	C-11	S. R.	2.004	9,715 35		4,848 00	1,804 00			18.6
	D-9—D-16	T. L.	1.000	10,470 93		10,471 00	750 00	$1,800 00		24.4
	D-16	T. L.	1.107	6,684 50		6,038 00	2,822 00			42.2
	E-9	S. R.	2.004	6,569 40		3,278 00	2,004 00			30.5
	F-15	T. L.	.123	815 50		6,630 00	394 00			48.3
Total			40.105	$129,292 33			$28,751 00	$1,800 00	$641 00	
Oceana	B-9	S. R.	15.052	$28,954 04		$1,924 00	$7,526 00			26.0
	E-9	S. R.	51.416	200,272 00		3,895 00	53,666 00		$1,990 00	27.8
Total			66.468	$228,226 04			$61,192 00		$1,990 00	
Ogemaw	B-9	S. R.	7.558	$18,694 79		$2,474 00	$3,779 00			20.2
	B-12	T. L.	.993	3,188 95		3,211 00	1,290 00			40.5
Total			8.551	$21,883 74			$5,069 00			
Ontonagon	A-9	S. R.	4.000	$5,788 50		$1,447 00	$1,000 00			17.3
	E-9	S. R.	3.566	17,128 00		4,803 00	3,566 00			20.8
	E-9	T. L.	5.000	23,188 67		4,638 00	10,000 00			43.2
Total			12.566	$46,105 17			$14,566 00			
Osceola	B-9	S. R.	29.775	$56,380 47		$1,894 00	$14,888 00		$375 00	27.1
	C-9	S. R.	1.126	2,974 72		2,642 00	844 00			28.4
	D-9	S. R.	.556	1,606 84		2,890 00	417 00			26.0
	E-9	S. R.	5.474	18,150 63		3,316 00	5,474 00			30.2
Total			36.931	$79,112 66			$21,623 00		$375 00	
Ottawa	B-9	S. R.	6.116	$14,914 00		$2,439 00	$3,058 00			20.4
	B-12	S. R.	4.953	19,413 30		3,920 00	3,219 00			16.6
	B-16	T. L.	2.886	13,904 31		4,818 00	4,906 00			35.3
	E-12	S. R.	1.000	5,779 00		5,779 00	1,300 00			22.4
Total			14.955	$54,011 18			$12,483 00			
Presque Isle	B-9	S. R.	2.024	$2,824 98		$1,396 00	$1,012 00			35.8
	B-16	S. R.	1.866	3,541 00		1,898 00	1,586 00			44.7
Total			3.890	$6,365 98			$2,598 00			
Roscommon	B-9	S. R.	4.490	$9,390 36		$2,091 00	$2,245 00			23.9
Total			4.490	$9,390 36		$2,091 00	$2,245 00			

TABLE NO. 19.—*Cost of roads, average cost per mile, and ratio of reward to cost by classes and widths for 1916 (supplementary to Table No. 18).*

County.	Class and width.	Miles.	Cost.		Average cost per mile.	Reward.		Paid 50 per cent additional.	Per cent cost paid by State.
			Original.	Rebuilt.		Original.	Rebuilt.		
Alger	A-14 S. R.	1.250	$1,029 00		$823 00	$469 00			45.6
	E-14 S. R.	.500	2,749 00		5,500 00	750 00			27.3
	E-14 T. L.	4.553	17,634 38		3,880 00	13,660 00			77.4
Total		6.303	$21,412 38			$14,879 00			
Allegan	B-9 S. R.	1.726	$5,582 95		$3,092 00	$863 00			17.9
	B-10 S. R.	4.440	15,646 60		3,525 00	2,428 00			15.5
	B-12 S. R.	.648	1,490 60		4,350 00	421 00			18.3
	E-9 S. R.	1.732	11,052 31		6,380 00	1,732 00			15.7
Total		8.546	$33,772 46			$5,444 00			
Antrim	B-9 S. R.	5.034	$23,204 84		$4,585 00	$2,517 00			10.9
	B-9—B-14 T. L.	1.960	4,190 90	$3,365 16	3,850 00	980 00	$1,962 00		37.6
	B-14 T. L.	2.000	5,992 95		2,995 00	3,000 00			50.0
Total		8.994	$33,388 69	$3,365 16		$6,497 00	$1,962 00		
Arenac	C-9 S. R.	2.250	$6,763 00		$3,005 00	$1,688 00			25.0
Total		2.250	$6,763 00			$1,688 00			
Barry	B-9 S. R.	1.064	$1,687 00		$1,677 00	$532 00			31.5
Total		1.064	$1,687 00			$532 00			
Bay	C-9 S. R.	2.553	$6,992 50		$1,735 00	$1,915 00			17.4
	E-9 S. R.	3.472	11,517 95		3,315 00	3,472 00			30.2
	E-9 T. L.	1.000	3,060 00		3,060 00	2,000 00			65.3
	E-9—F-16 T. L.	.500	1,892 00	$5,103 53	13,991 00	500 00	$1,200 00		12.2
Total		7.525	$23,462 45	$5,103 53		$7,887 00	$1,200 00		
Bensie	B-9 S. R.	4.084	$7,552 84		$1,852 00	$2,042 00			27.0
	B-12 S. R.	1.046	3,245 97		3,103 00	681 00			21.0
	B-12 T. L.	1.000	2,226 27		2,226 00	1,300 00			58.4
	B-9—B-15 T. L.	.500	638 64	$445 80	2,168 00	250 00	$550 00		73.8
	B-15 T. L.	1.000	3,746 43		3,746 00	1,600 00			42.7
Total		7.630	$17,410 15	$445 80		$5,873 00	$550 00		



Two span reinforced concrete girder bridge built by the State Highway Department over the Red Cedar river nine miles east of Lansing on the Detroit road.

Berrien	B-12	T. L.	.502	$2,293 53		$4,540 00	$652 00			18.4
	E-9	S. R.	—.607	—3,475 31			—607 00			
	E-10	S. R.	.189	963 50		5,090 00	208 00			21.6
	E-12	S. R.	7.773	62,120 26		8,035 00	10,105 00			16.3
	E-16	T. L.	2.083	16,114 84		7,730 00	7,082 00			44.0
	E-9—E-16	T. L.	1.360	6,123 00	$7,500 00	10,000 00	1,360 00	$952 00		17.0
							$18,800 00	$952 00		

Berrien	B-12	T. L.	.502	$2,293 53		$4,540 00	$652 00			18.4
	E-9	S. R.	—.607	—3,475 31			—607 00			
	E-10	S. R.	.189	963 50		5,090 00	208 00			21.6
	E-12	S. R.	7.773	62,120 26		8,035 00	10,105 00			16.3
	E-16	T. L.	2.083	16,114 84		7,730 00	7,082 00			44.0
	E-9—E-16	T. L.	1.360	6,123 00	$7,500 00	10,000 00	1,360 00	$952 00		17.0
Total			11.300	$84,139 82	$7,500 00		$18,800 00	$952 00		
Branch	B-9	S. R.	4.112	$9,159 58		$2,228 00	$2,056 00			28.0
	C-16	T. L.	1.506	6,886 22		4,575 00	3,840 00			55.8
	E-16	T. L.	1.042	8,131 29		7,710 00	3,542 00			43.6
Total			6.660	$24,177 09			$9,438 00			
Calhoun	B-9	S. R.	12,092	$32,462 59		$2,685 00	$6,046 00			18.8
	B-9—B-16	T. L.	.500	1,250 00	$1,795 00	6,090 00	250 00	$600 00		68.0
	B-16	S. R.	1.636	4,123 30		2,520 00	1,391 00			33.7
	B-16	T. L.	2.315	12,847 00		5,550 00	3,936 00			30.6
	C-9	S. R.	10.605	33,668 92		3,175 00	7,953 00			23.7
	C-16	T. L.	1.460	10,542 54		7,220 00	3,724 00			35.4
Total			28.608	$94,894 35	$1,795 00		$23,300 00	$600 00		
Cass	B-9	S. R.	9.000	$22,712 86		$2,543 00	$4,500 00			19.8
Total			9.000	$22,712 86			$4,500 00			
Charlevoix	B-9	S. R.	7.061	$23,399 58		$3,300 00	$3,531 00			15.1
	B-15	T. L.	.246	1,641 40		6,670 00	394 00			24.0
	C-15	T. L.	.606	1,780 25		2,940 00	1,454 00			81.7
	E-9	S. R.	1.200	3,970 15		3,310 00	1,200 00			30.2
	E-15	T. L.	1.023	6,805 56		6,650 00	3,274 00			48.1
Total			10.136	$37,596 94			$9,853 00			
Cheboygan	B-10	S. R.	.502	$808 86		$1,610 00	$276 00			34.2
	E-9	S. R.	.632	2,720 55		4,290 00	632 00			23.3
	E-10	T. L.	2.000	9,719 00		1,859 00	4,400 00			45.3
	E-14	S. R.	.322	1,996 54		6,200 00	483 00			24.2
	E-14	T. L.	1.987	8,337 29		4,195 00	4,766 00			57.2
	E-15	T. L.	2.747	14,448 00		5,260 00	8,676 00			60.0
Total			8.190	$38,030 24			$19,233 00			
Clare	B-9	S. R.	4.750	$9,154 53		$1,925 00	$2,375 00			26.0
	B-12	T. L.	3.251	8,870 95		1,730 00	4,226 00			37.5
	B-15	T. L.	.501	1,765 04		3,530 00	802 00			45.4
Total			8.502	$19,790 52			$7,403 00			

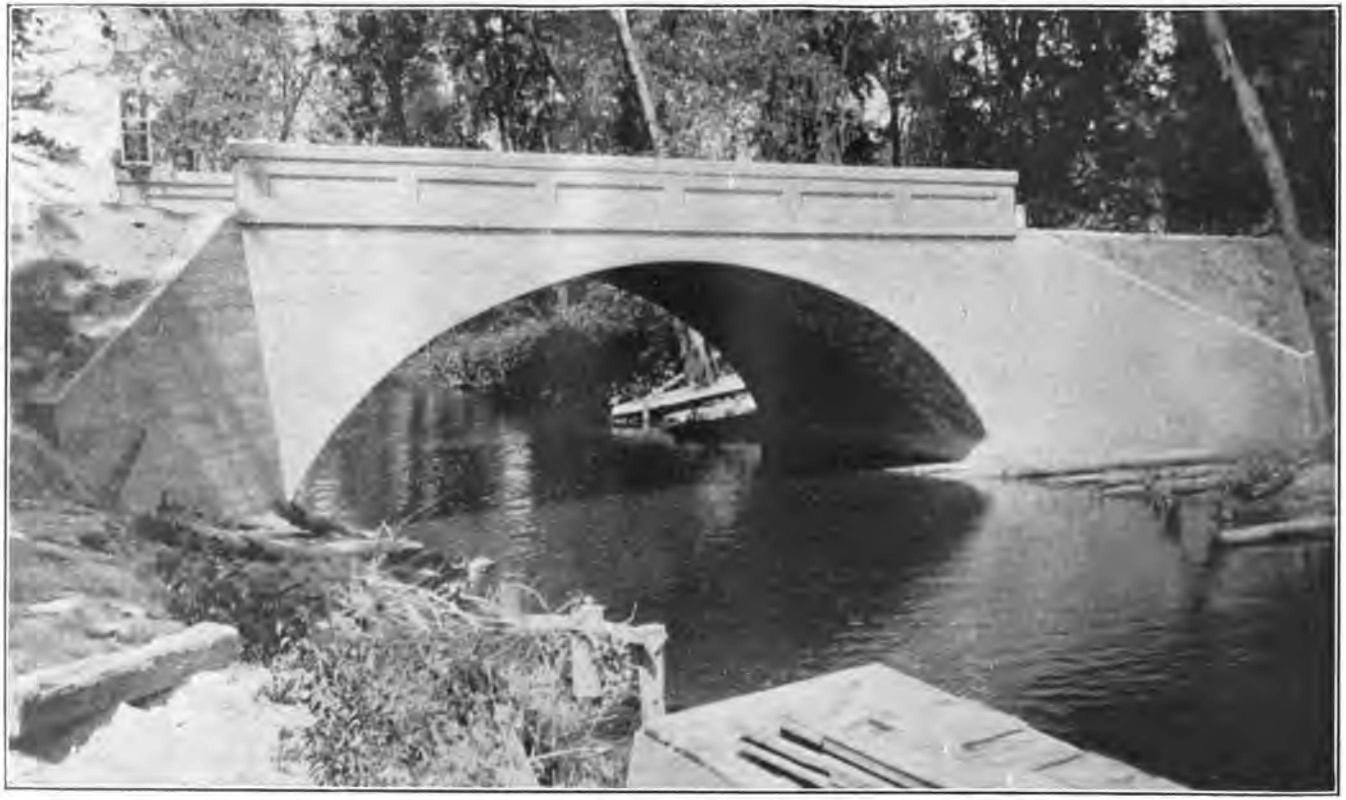
TABLE NO. 19.—CONTINUED.

County.	Class and width.	Miles.	Cost. Original.	Cost. Rebuilt.	Average cost per mile.	Reward. Original.	Reward. Rebuilt.	Paid 50 per cent additional.	Per cent cost paid by State.
Clinton	B-9 S. R.	9.252	$29,618 77		$3,208 00	$4,626 00			15.6
	B-16 T. L.	.500	1,495 80		2,991 00	850 00			56.8
	C-9 S. R.	1.756	5,746 96		3,280 00	1,318 00			23.0
Total		11.508	$36,861 53			$6,794 00			
Crawford	B-9 S. R.	1.014	$3,147 90		$3,100 00	$507 00			16.1
Total		1.014	$3,147 90			$507 00			
Delta	E-9 S. R.	—7.004	—$29,046 47			—$7,004 00			
	E-16 S. R.	.784	3,082 26		$3,960 00	1,333 00			43.3
	E-9—E-16 T. L.	9.376	38,252 65	$22,372 40	6,470 00	9,376 00	$22,503 00		83.3
	E-16 T. L.	5.846	35,941 21		6,140 00	19,874 00			55.3
Total		9.002	$48,229 65	$22,372 40		$23,579 00	$22,503 00		
Dickinson	A-9 T. L.	5.000	$12,801 68		$2,560 00	$2,500 00			19.5
	B-16 T. L.	.315	650 49		2,065 00	536 00			82.4
	E-9—C-16 T. L.	(—)2.081	(—)10,183 62	$6,917 87	8,220 00	(—)2,081 00	$2,130 00		24.6
Total		5.315	$13,452 17	$6,917 87		$3,036 00	$2,130 00		
Eaton	B-9 S. R.	9.812	$21,353 79		$2,295 00	$4,906 00			23.0
	B-16 S. R.	3.122	10,245 56		3,280 00	2,654 00			25.9
Total		12.934	$31,599 35			$7,560 00			
Emmet	B-15 S. R.	.120	$529 45		$4,320 00	$96 00			18.1
	B-15 T. L.	1.612	4,967 85		3,040 00	2,580 00			52.0
	E-9 S. R.	1.214	5,525 00		4,550 00	1,214 00			21.8
	E-15 T. L.	1.246	7,395 81		5,935 00	3,988 00			53.9
Total		4.192	$18,418 11			$7,878 00			
Genesee	B-9 S. R.	26.700	$74,648 18		$2,815 00	$13,350 00			17.9
	C-9 S. R.	.995	3,231 72		3,245 00	746 00			23.1
Total		27.695	$77,879 90			$14,096 00			

Grand Traverse	B-9	S. R.	1.008	$1,125 94		$1,116 00	$504 00			44.8
	B-12	S. R.	2.433	8,864 02		3,630 00	1,581 00			17.8
	B-9—B-12	T. L.	.500	2,131 75	$1,625 43	7,514 00	250 00	$400 00		17.3
	B-14	S. R.	.856	2,141 04		2,500 00	641 00			29.9
	B-14	T. L.	1.826	6,577 68		3,600 00	2,738 00			41.6
	E-10	S. R.	.511	2,292 36		4,485 00	563 00			24.6
	D-10	S. R.	.994	4,576 00		4,575 00	820 00			19.9
Total			8.128	$27,708 79	$1,625 43		$7,097 00	$400 00		
Gratiot	A 9	S. R.	4.866	$4,750 44		$976 00	$1,215 00			25.5
	B-9	S. R.	3.524	7,785 44		2,215 00	1,762 00			22.6
Total			8.390	$12,535 88			$2,977 00			
Hillsdale	B-9	S. R.	7.112	$20,454 86		$2,875 00	$3,556 00		+$156 00	17.4
	E-9	S. R.	6.643	15,938 89		2,400 00	6,643 00		+416 00	41.7
	E-16	T. L.	1.250	7,309 14		5,850 00	4,250 00			58.2
Total			15.005	$43,702 89			$14,449 00		+$572 00	
Houghton	E-9—E-15	T. L.	(—)1.061	(—)$6,936 71	$654 15	$7,160 00	(—)$1,061 00	$1,805 00		37.8
	E-15	T. L.	3.521	21,113 00		6,000 00	11,268 00			53.4
	E-16	T. L.	.681	9,840 00		15,600 00	2,316 00			23.5
Total			4.202	$30,953 00	$654 15		$13,584 00	$1,805 00		
Huron	B-9	S. R.	22.296	$49,754 33		$2,223 00	$11,148 00			22.4
	B-15	T. L.	2.000	6,620 00		3,310 00	3,200 00			48.4
	B-16	S. R.	.124	692 65		5,580 00	105 00			15.2
	C-9	S. R.	1.000	5,400 56		5,400 00	750 00			13.9
	E-9	S. R.	1.132	4,326 37		3,820 00	1,132 00			26.2
Total			26.552	$66,793 91			$16,335 00			
Ingham	B-9	S. R.	8.380	$27,389 35		$3,265 00	$4,190 00		+$545 00	15.3
	B-16	T. L.	5.063	45,605 82		9,010 00	8,608 00			18.9
Total			13.443	$72,995 17			$12,798 00		+$545 00	
Ionia	B-9	S. R.	3.674	$6,377 07		$1,736 00	$1,837 00			28.9
	B-16	S. R.	1.004	3,245 00		3,120 00	853 00			26.3
	B-16	T. L.	7.120	23,509 08		3,313 00	10,921 00			46.4
Total			11.798	$33,131 15			$13,611 00			
Iosco	A-9	S. R.	1.000	$2,169 11		$2,169 00	$250 00			11.5
	A-12	T. L.	2.028	1,443 47		712 00	1,318 00			91.3
	B-9	S. R.	2.018	7,776 04		3,835 00	1,009 00			13.0
	B-12	T. L.	1.507	7,684 46		5,100 00	1,960 00			25.5
Total			6.553	$19,073 08			$4,537 00			

TABLE NO. 19.—CONTINUED.

County.	Class and width.	Miles.	Cost.		Average cost per mile.	Reward.		Paid 50 per cent additional.	Per cent cost paid by State.
			Original.	Rebuilt.		Original.	Rebuilt.		
Iron	B-9—B-16 T. L.	(—)5.032	(—)$15,729 65	$3,767 49	$1,878 00	(—)$2,516 00	$5,441 00		40.8
	B-16 T. L.	5.468	26,984 00		4,935 00	9,296 00			34.5
	B-9—B-16 T. L.	(—).384	(—)3,181 32	415 00	9,380 00	(—)192 00	788 00		27.3
	E-16 T. L.	4.171	35,480 95		8,500 00	14,182 00			40.0
Total		9.639	$62,464 95	$4,182 49		$23,478 00	$6,229 00		
Isabella	B-9 S. R.	6.018	$14,738 59		$2,388 00	$3,009 00			20.4
	B-15 T. L.	.998	2,950 00		2,958 00	1,596 00			54.0
	C-9 S. R.	1.000	2,717 89		2,717 00	750 00			27.7
Total		8.016	$20,406 48			$5,355 00			
Jackson	B-9 S. R.	15.279	$56,173 80		$3,675 00	$7,640 00			13.6
	B-12 S. R.	1.000	3,300 00		3,300 00	650 00			19.7
	B-12 T. L.	2.018	8,578 72		4,250 00	2,624 00			30.6
	B-16 T. L.	2.247	17,234 80		7,670 00	3,820 00			22.2
	C-16 S. R.	1.346	8,020 00		5,960 00	1,716 00			21.4
	E-9 S. R.							+$500 00	
Total		21.890	$93,307 32			$16,450 00		+$500 00	
Kalamazoo	B-9 S. R.	2.908	$7,353 45		$2,530 00	$1,454 00			19.8
	B-11 S. R.	.500	1,058 89		2,117 00	300 00			28.3
	B-14 S. R.	1.834	7,215 17		3,935 00	1,375 00			19.0
	B-16 T. L.	1.414	6,529 98		4,620 00	2,404 00			36.8
	E-9 S. R.	1.815	7,946 89		4,380 00	1,815 00			22.8
Total		8.471	$30,104 38			$7,348 00			
Kalkaska	A-9 S. R.	.388	$360 00		$928 00	$97 00			27.0
	B-9 S. R.	3.338	11,461 34		3,433 00	1,669 00			14.6
	B-9 T. L.	1.007	1,676 66		1,665 00	1,006 00			60.0
	C-9 S. R.	.500	916 00		1,832 00	375 00			40.9
	E-9 S. R.	.401	1,360 50		3,395 00	401 00			29.5
Total		5.634	$15,774 50			$3,548 00			
Kent	B-9 S. R.	3.012	$7,115 00		$2,368 00	$1,506 00			21.3
	B-10 S. R.	15.846	93,826 09		5,420 00	9,235 00			16.9
	B-12 S. R.	5.257	33,252 84		6,330 00	3,417 00			10.3
	B-14 S. R.	.786	13,167 72		16,750 00	590 00			5.2
	C-16 T. L.	4.044	24,920 34		6,160 00	10,311 00			41.4
Total		28.945	$172,281 99			$25,059 00			



A forty foot concrete arch over Paw Paw lake outlet north of Watervliet, Berrien county.

Lake	S. R.	1.040	$1,278 13		$1,228 00	$520 00			40.7
Total		1.040	$1,278 13			$520 00			
Lapeer	A-9 S. R.	2.520	$6,404 40		$2,545 00	$630 00			9.8
	B-9 S. R.	9.048	24,722 63		2,735 00	4,524 00			18.3
	C-9 S. R.	1.495	5,159 40		3,450 00	1,121 00			21.8
Total		13.063	$36,286 43			$6,275 00			
Leelanau	B-9 S. R.	4.364	$10,653 58		$2,448 00	$2,182 00			20.3
	B-12 S. R.	.398	46 25		116 00	259 00			100.0
	B-12 T. L.	3.040	8,302 80		2,733 00	3,952 00			47.6
	D-12 T. L.	1.013	2,891 25		2,852 00	1,976 00			68.3
Total		8.815	$21,893 88			$8,369 00			
Lenawee	A-15 T. L.							+$202 00	
	E-9 S. R.	1.136	$4,924 55		$4,335 00	$1,136 00			23.1
	E-12 S. R.	3.334				4,334 00			
Total		4.470				$5,470 00		+$202 00	
Livingston	B-9 S. R.	14.284	$29,317 61		$2,054 00	$7,142 00		+$250 00	24.4
	B-12 T. L.	2.102	6,356 17		3,022 00	2,104 00			33.1
	B-16 T. L.	1.000	4,586 44		4,586 00	850 00			18.6
Total		17.386	$40,260 22			$10,096 00		+$250 00	
Luce	B-12 T. L.	.114	$780 00		$6,840 00	$74 00			9.5
	C-12 T. L.	1.652	10,273 86		6,215 00	1,610 00			15.7
	E-12 T. L.	2.708	11,968 10		4,320 00	3,520 00			29.4
	E-14 T. L.	1.004	7,072 00		7,040 00	1,506 00			21.4
Total		5.478	$30,093 96			$6,710 00			
Macomb	B-14 S. R.	.236	$1,125 00		$4,770 00	$177 00			10.4
	C-9 S. R.	.640	1,109 08		1,720 00	485 00			43.7
	C-14 S. R.	3.327	17,513 54		6,435 00	3,743 00			21.4
	C-16 S. R.	1.855	12,470 00		6,725 00	2,365 00			19.0
	C-16 T. L.	2.167	16,907 11		7,420 00	4,062 00			24.0
	E-16 S. R.	1.304	6,107 32		4,680 00	2,217 00			36.3
Total		9.529	$55,223 05			$13,049 00			
Manistee	B-9 S. R.	1.412	$4,685 11		$3,320 00	$706 00			15.1
	B-10 S. R.	.572	1,300 00		2,273 00	315 00			24.2
	B-11 S. R.	2.400	8,096 58		3,372 00	1,440 00			17.8
	B-12 S. R.	2.810	5,874 61		2,090 00	1,827 00			31.1
	C-16 T. L.	.250	1,965 55		7,870 00	638 00			32.5
	B-9—E-16 T. L.	.520	1,640 00	$2,593 00	8,140 00	260 00	$1,508 00		41.8
	E-16 T. L.	.500	3,772 50		7,543 00	1,700 00			45.0
Total		8.464	$27,334 35	$2,593 00		$6,886 00	$1,508 00		

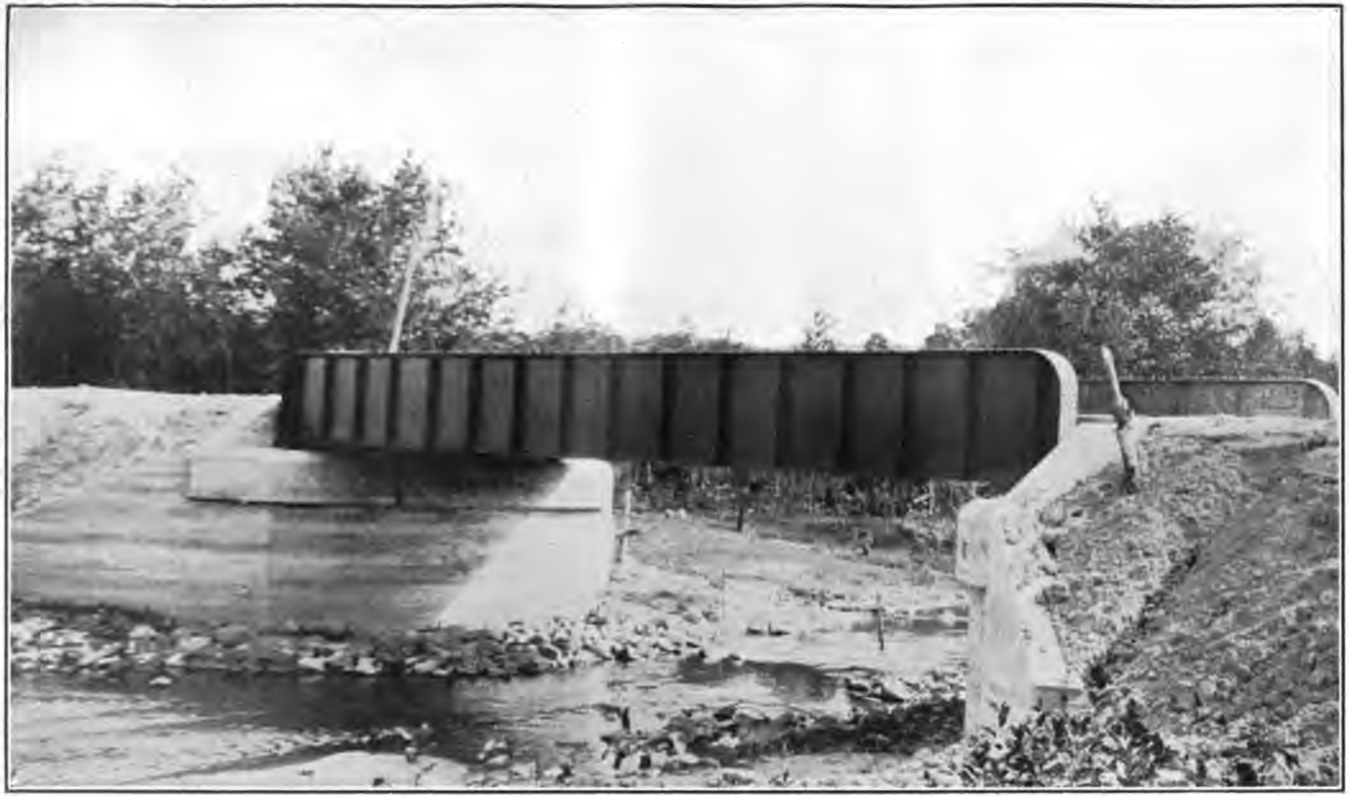
TABLE NO. 19.—CONTINUED.

County.	Class and width.	Miles.	Cost.		Average cost per mile.	Reward.		Paid 50 per cent additional.	Per cent cost paid by State.
			Original.	Rebuilt.		Original.	Rebuilt.		
Marquette	C-14 T. L.	1.604	$10,218 30		$6,370 00	$3,620 00			35.4
Total		1.604	$10,218 30			$3,620 00			
Mason	B-9 S. R.	7.658	$14,934 14		$1,953 00	$3,829 00			25.6
Total		7.658	$14,934 14			$3,829 00			
Mecosta	B-9 S. R.	5.890	$13,036 86		$2,210 00	$2,945 00			22.6
Total		5.890	$13,036 86			$2,945 00			
Menominee	B-9 S. R.	11.434	$14,206 74		$1,242 00	$5,717 00			40.0
	C-16 T. L.	5.012	22,249 71		4,440 00	8,656 00			38.9
	E-16 T. L.	.954	4,617 03		4,830 00	1,622 00			35.2
Total		17.400	$41,073 51			$15,995 00			
Midland	A-9 S. R.	1.498	$1,193 96		$797 00	$374 00			31.4
	A-9 T. L.	2.145	2,920 00		1,362 00	536 00			18.4
	B-9 S. R.	2.716	6,031 00		2,220 00	1,358 00			22.5
	E-9 T. L.	3.461	20,528 13		5,930 00	6,922 00			33.8
Total		9.820	$30,673 09			$9,190 00			
Missaukee	B-9 S. R.	3.028	$7,925 00		$2,620 00	$1,514 00			19.1
	B-12 T. L.	1.000	2,300 00		2,300 00	650 00			28.3
Total		4.028	$10,225 00			$2,164 00			
Monroe	C-16 T. L.	1.004	$7,206 69		$7,173 00	$2,560 00			35.5
	E-10 S. R.	.142	972 00		6,850 00	156 00			16.1
	E-14 S. R.	2.240	17,089 11		7,630 00	3,173 00			18.0
	E-15 S. R.	1.100	7,865 00		7,150 00	1,760 00			22.4
Total		4.486	$33,132 80			$7,649 00			
Montcalm	B-9 S. R.	8.279	$22,754 14		$2,750 00	$4,139 00			18.2
Total		8.279	$22,754 14			$4,139 00			

Muskegon	A-9	S. R.	.500	$518 00		$1,036 00	$125 00			24.1
	E-9	S. R.	3.275	16,318 36		4,985 00	3,275 00			22.1
	E-16	T. L.	.909	9,004 17		9,910 00	3,090 00			34.3
Total			4.684	$25,840 53			$6,490 00			
Newaygo	B-9	S. R.	7.720	$19,781 79		$2,710 00	$3,860 00			19.5
	B-16	S. R.	.271	2,258 93		8,330 00	230 00			10.2
Total			7.991	$22,040 72			$4,090 00			
Oakland	B-9	S. R.	7.131	$24,235 94		$3,400 00	$3,565 00			14.7
	B-12	S. R.	.537	2,580 00		4,808 00	349 00			13.5
	B-16	T. L.	1.062	4,694 79		4,420 00	1,806 00			38.5
	C-9	S. R.	1.272	5,000 66		3,930 00	954 00			19.1
	C-11	S. R.	2.813	10,987 45		3,910 00	2,534 00			23.1
	C-12	S. R.	4.965	29,141 99		5,870 00	4,840 00			16.6
	C-16	T. L.	1.953	17,841 98		9,132 00	4,980 00			17.9
	E-9	S. R.	1.486	8,425 24		5,670 00	1,486 00			17.6
	F-16	T. L.	4.210	59,402 61		14,120 00	14,314 00			24.1
Total			25.422	$162,310 66			$34,828 00			
Oceana	B-9	S. R.	.999	$1,602 00		$1,602 00	$500 00			31.2
	E-9	S. R.	1.125	5,187 00		4,610 00	944 00			18.2
	E-9	T. L.	2.250	7,008 00		3,115 00				
	E-15	T. L.	2.056	19,585 56		9,528 00	6,580 00			33.6
	E-16	T. L.	.955	2,970 00		3,110 00	1,623 00			54.6
	E-9—E-16	T. L.	.181	804 00	$534 00	7,370 00	181 00	$127 00		38.3
Total			7.385	$37,156 56	$534 00		$9,828 00	$127 00		
Ogemaw	B-9	S. R.	5.520	$14,902 61		$2,700 00	$2,760 00			18.5
	C-12	T. L.	1.743	9,205 12		5,280 00	3,400 00			37.0
	E-12	T. L.	.246	1,225 00		4,980 00	640 00			52.2
Total			7.509	$25,332 73			$6,800 00			
Ontonagon	E-9	S. R.	.984	$7,574 89		$7,695 00	$984 00			15.0
Total			.984	$7,574 89			$984 00			
Osceola	B-9	S. R.	3.512	$7,140 81		$2,033 00	$1,756 00			24.6
	B-12	T. L.	1.008	4,074 81		4,042 00	1,310 00			32.2
	B-15	T. L.	.587	2,570 00		4,380 00	470 00			18.3
	E-9	S. R.	1.012	2,009 28		1,986 00	1,012 00			50.4
	C-15	T. L.	.988	3,390 03		3,435 00	1,786 00			52.7
Total			7.107	$19,184 93			$6,334 00			

TABLE NO. 19.—CONCLUDED.

County.	Class and width.	Miles.	Cost.		Average cost per mile.	Reward.		Paid 50 per cent additional.	Per cent cost paid by State.
			Original.	Rebuilt.		Original.	Rebuilt.		
Ottawa	B-9 S. R.	20.096	$60,591 39		$3,045 00	$10,048 00			16.6
	B-16 T. L.	2.570	17,326 41		5,240 00	2,184 00			12 6
	E-9 S. R.	.508	2,296 40		4,540 00	508 00			22.1
Total		23.174	$80,214 20			$12,740 00			
Presque Isle	B-9 S. R.							+$506 00	...
	B-9 T. L.	1.992	$10,973 00		$5,508 00	$996 00			9.1
	B-16 S. R.	1.000	3,930 00		3,930 00	850 00		+793 00	21.6
Total		2.992	$14,903 00			$1,846 00		+$1,299 00	
Saginaw	B-9 S. R.	3.708	$10,534 01		$2,840 00	$1,854 00			17.6
	B-16 T. L.	1.000	5,541 05		5,541 00	1,700 00			30 7
	E-9 S. R.	24.430	129,284 62		5,290 00	24,430 00		+$3,391 00	18.9
	E-16 T. L.	3.974	28,657 93		7,210 00	8,456 00			29.5
Total		33.112	$174,017 61			$36,440 00		+$3,391 00	
Sanilac	B-9 S. R.	8.422	$2,071 37		$1,437 00	$4,211 00			34.9
	B-12 S. R.	1.000	1,435 68		1,435 00	650 00			45.3
	B-15 T. L.	3.000	12,910 00		4,300 00	4,800 00			37.2
	C-9 S. R.	1.004	4,014 95		4,014 00	753 00			18.8
	E-9 S. R.	2.558	10,005 00		3,915 00	2,558 00			25.6
	E-15 T. L.	1.000	6,029 36		6,029 00	1,600 00			26.4
Total		16.984	$46,466 36			$42,293 00			
Schoolcraft	E-9 S. R.	3.020	$20,723 55		$6,865 00	$3,020 00			14.6
Total		3.020	$20,723 55			$3,020 00			
Shiawassee	B-9 S. R.	18.850	$42,389 20		$2,248 00	$9,425 00			22.3
	B-16 T. L.	2.613	9,907 24		3,790 00	4,442 00			44.9
Total		21.463	$52,296 44			$13,867 00			
St. Clair	A-9 S. R.	.746	$1,495 00		$2,010 00	$187 00			12 5
	B-16 T. L.	1.134	5,056 64		4,460 00	964 00			19.1
	E-9—E-16 T. L.	(−)1.842	(−)4,636 40	$9,720 63	7,800 00	(−)1,842 00	$1,397 00		22.6
	E-16 T. L.	2.509	20,728 38		1,735 00	4,355 00			21.0
Total		4.389	$27,280 02	$9,720 63		$5,506 00	$1,397 00		



A fifty-five foot plate girder bridge on the trunk line road two miles north of Whittemore, Iosco county.
Built by the State Highway Department.

St. Joseph	A-9 S. R.	3.999	$11,790 10		$2,948 00	$750 00			6.4
	B-9 S. R.	4.632	11,332 13		2,445 00	2,316 00			20.9
	B-16 T. L.	.687	3,492 43		5,080 00	1,168 00			33.4
	E-9 S. R.	1.004	4,269 64		4,250 00	1,004 00			23 5
Total		10.322	$30,884 30			$5,238 00			
Tuscola	B-9 S. R.	21.008	$50,432 29		$2,402 00	$10,504 00			20.9
	B-15 T. L.	1.500	5,823 53		3,885 00	1,200 00			21.1
	C-9 S. R.	1.004	4,101 39		4,085 00	753 00			18.4
	E-9 S. R.	1.850	10,537 00		5,692 00	1,850 00			17.6
	E-16 T. L.	2.786	21,046 01		7,550 00	6,284 00			29.9
Total		28.148	$91,940 22			$20.591 00			
Van Buren	B-9 S. R.	2.816	$6,515 08		$2,313 00	$1,408 00			21.6
	C-16 T. L.	2.698	15,868 78		5,880 00	4,866 00			31.3
	B-9—D-9 S. R.	1.000	1,927 00	$2,555 88	4,482 00	500 00	$250 00		16.7
	E-9 S. R.	.588	2,837 73		4,825 00	588 00			20.7
	E-16 T. L.	2.376	21,260 72		8,943 00	5,399 00			25.3
Total		9.478	$48,409 31	$2,555 88		$12,761 00	$250 00		
Washtenaw	B-9 S. R.	4.604	$9,631 64		$2,092 00	$2,302 00			24.0
	B-16 T. L.	1.121	3,964 50		3,535 00	1,906 00			48.1
Total		5.725	$13,596 14			$4,208 00			
Wayne	B-12 S. R.	.122	$612 87		$5,022 00	$79 00			12.9
	C-12 S. R.	1.000	6,582 60		6,582 00	975 00			14.8
	F-12 S. R.	3.378	38,200 00		11,315 00	4,392 00			11.5
	F-15 S. R.	5.053	83,420 16		16,530 00	8,084 00			9 7
	E-9—F-16 S. R.	(−)1.910	(−)9,893 00	$30,705 47	21,120 00	(−)1,910 00	$1,337 00		8.0
	E-9—F-16 T. L.	(−)1.022	(−)13,089 00	21,246 06	33,580 00	(−)1,022 00	2,292 00		9.6
	F-16 S. R.	1.609	23,251 85		14,450 00	2,735 00			11.8
	F-16 T. L.	7.566	100,392 00		13,260 00	12,861 00			12.8
Total		18.728	$252,459 48	$51,951 53		$29,126 00	$3,629 00		
Wexford	B-9 S. R.	4.594	$7,207 81		$1,568 00	$2,297 00			31.9
	C-14 T. L.	.442	2,032 85		1,398 00	497 00			24.4
	C-15 T. L.	.490	2,583 65		5,270 00	1,176 00			41.6
Total		5.526	$11,824 31			$3,970 00			

Notes: —Amounts indicated by minus sign alone have been considered as minus in striking the total. The negative quantity is due to the fact that the class and width so indicated has been rebuilt under another class and width to a greater mileage than was constructed of the indicated width, thus creating a deficiency in that class for the year.

(—)Amounts indicated by the minus sign in parenthesis have not been considered in striking the total. This is due to the fact the class and width so indicated have been rebuilt under another class and width as shown. When so indicated, it will be found that no mileage of the original class and width was constructed during the year. Thus no additional mileage has been added but the mileage indicated has been taken out of one class and placed in another. To bring the table up to date for all mileage constructed, the amounts indicated by (—) should be subtracted from the original class and width in the same county in Table 18.

+The plus sign indicates that 50 per cent additional reward has been paid on roads previously constructed and lying on the routes laid out as trunk lines. The amount indicated should be added to the corresponding class and width in the same county in Table 18.

St. Joseph	A-9 S. R. B-9 S. R. B-16 T. L. E-9 S. R.	3.999 4.632 .687 1.004	$11,790 10 11,332 13 3,492 43 4,269 64		$2,948 00 2,445 00 5,080 00 4,250 00	$750 00 2,316 00 1,168 00 1,004 00			6.4 20.9 33.4 23.5
Total		10.322	$30,884 30			$5,238 00			
Tuscola	B-9 S. R. B-15 T. L. C-9 S. R. E-9 S. R. E-16 T. L.	21.008 1.500 1.004 1.850 2.786	$50,432 29 5,823 53 4,101 39 10,537 00 21,046 01		$2,402 00 3,885 00 4,085 00 5,692 00 7,550 00	$10,504 00 1,200 00 753 00 1,850 00 6,284 00			20.9 21.1 18.4 17.6 29.9
Total		28.148	$91,940 22			$20.591 00			
Van Buren	B-9 S. R. C-16 T. L. B-9—D-9 S. R. E-9 S. R. E-16 T. L.	2.816 2.698 1.000 .588 2.376	$6,515 08 15,868 78 1,927 00 2,837 73 21,260 72	 $2,555 88 	$2,313 00 5,880 00 4,482 00 4,825 00 8,943 00	$1,408 00 4,866 00 500 00 588 00 5,399 00	 $250 00 		21.6 31.3 16.7 20.7 25.3
Total		9.478	$48,409 31	$2,555 88		$12,761 00	$250 00		
Washtenaw	B-9 S. R. B-16 T. L.	4.604 1.121	$9,631 64 3,964 50		$2,092 00 3,535 00	$2,302 00 1,906 00			24.0 48.1
Total		5.725	$13,596 14			$4,208 00			
Wayne	B-12 S. R. C-12 S. R. F-12 S. R. F-15 S. R. E-9—F-16 S. R. E-9—F-16 T. L. F-16 S. R. F-16 T. L.	.122 1.000 3.378 5.053 (−)1.910 (−)1.022 1.609 7.566	$612 87 6,582 60 38,200 00 83,420 16 (−)9,893 00 (−)13,089 00 23,251 85 100,392 00	 $30,705 47 21,246 06 	$5,022 00 6,582 00 11,315 00 16,530 00 21,120 00 33,580 00 14,450 00 13,260 00	$79 00 975 00 4,392 00 8,084 00 (−)1,910 00 (−)1,022 00 2,735 00 12,861 00	 $1,337 00 2,292 00 		12.9 14.8 11.5 9.7 8.0 9.6 11.8 12.8
Total		18.728	$252,459 48	$51,951 53		$29,126 00	$3,629 00		
Wexford	B-9 S. R. C-14 T. L. C-15 T. L.	4.594 .442 .490	$7,207 81 2,032 85 2,583 65		$1,568 00 1,398 00 5,270 00	$2,297 00 497 00 1,176 00			31.9 24.4 41.6
Total		5.526	$11,824 31			$3,970 00			

Notes: —Amounts indicated by minus sign alone have been considered as minus in striking the total. The negative quantity is due to the fact that the class and width so indicated has been rebuilt under another class and width to a greater mileage than was constructed of the indicated width, thus creating a deficiency in that class for the year.

(—)Amounts indicated by the minus sign in parenthesis have not been considered in striking the total. This is due to the fact the class and width so indicated have been rebuilt under another class and width as shown. When so indicated, it will be found that no mileage of the original class and width was constructed during the year. Thus no additional mileage has been added but the mileage indicated has been taken out of one class and placed in another. To bring the table up to date for all mileage constructed, the amounts indicated by (—) should be subtracted from the original class and width in the same county in Table 18.

+The plus sign indicates that 50 per cent additional reward has been paid on roads previously constructed and lying on the routes laid out as trunk lines. The amount indicated should be added to the corresponding class and width in the same county in Table 18.

APPENDIX "A"

INSTRUCTIONS AND SPECIFICATIONS
FOR THE
CONSTRUCTION, MAINTENANCE, AND REPAIR
OF
STATE REWARD ROADS.

GENERAL SPECIFICATIONS FOR STATE REWARD ROADS.

CLASS A.—(CLAY-SAND), (LEAN GRAVEL) OR (ONE COURSE GRAVEL).

Section 10, Chapter V, Act No. 283, Public Acts 1909 as Amended.

If the work is to be done by contract, write the State Highway Department for blank forms for bids, contracts and bonds. They will be furnished without charge.

If good gravel is obtainable within a reasonable haul, say three miles, there is no economy in class A construction, except for the one course gravel road, and at best a clay-sand road does not rank with a gravel road. The construction cost of a clay-sand road varies from one thousand to as high as eighteen hundred dollars per mile. The higher cost, it can be seen, does not vary much from the cost of gravel roads. Townships and counties desiring to construct this class of road should place their application in the hands of the State Highway Department early in the season so that an engineer can be sent over the ground where the road is proposed to be built and recommend the quality of clay and sand or the grade of gravel which is to be used.

Grading.—The roadway shall be graded so as to strictly conform to the plans and specifications for the road in question, heretofore submitted to and approved by the State Highway Commissioner. The finished road shall be not less than twenty feet between and exclusive of side ditches or gutters and have a cross section oval in form with an average rise of one inch to the foot from the inner edge of each ditch or gutter to the center line of the road. In general, earth for fills should be taken from cuts. In no case shall deep unsightly ditches be cut along the roadside for the purpose of making fills, nor shall earth be wasted between the ditches and side lines of the road unless required for filling hollows.

Drainage.—The side ditches and gutters shall be of such size as the drainage requirements of the locality demand, and must be formed with true grades, having sufficient incline to cause a free and uniform flow of water to the nearest natural outlets, which outlets must be so improved where necessary as to carry the water quickly away from the highway. The slope of the banks of ditches shall be not steeper than one and one-half horizontal to one vertical.

Tile drains shall be laid where needed, at such places, of such kind and size and on such grades as may be shown on the plans. Concrete headwalls must be built on all culverts.

In clay soils trenches shall be cut through the shoulders, described in the next paragraph, making outlets into the side ditches for water that may collect in the metal bed during construction and later before the surface becomes hard and water-proof. Such trenches shall be eight inches or more in width and slightly deeper than the metal bed. They shall be placed at all low points in the grade and not farther than one hundred feet apart in retentive soils and must be filled with gravel or other porous material when the first layer of metal is being applied.

Metal Bed and Shoulders.—After the road has been graded as above described the metal bed shall be formed in the central part of the road grade as follows: Shoulders of firm earth, or other suitable material shall be placed on each side of the metal bed not less than nine feet apart or such greater distance as may be required to retain the width of metal specified. The shoulders shall extend to the side ditches or gutters at the same grade and curvature as required for the finished road. Where the road grade is high the shoulders may be formed by moving earth from the center of the present road grade to the sides, or, if the grade is low, by crowning the present road grade by scraping earth from the sides toward the center, or, if sufficient suitable material cannot be had along the roadway, it shall be brought from other places that shall be specified by the officers in charge of the work.

After the road has been graded, one of the three following forms of construction for metal track must be used. Use the one which will give the best construction with materials which may be had locally.

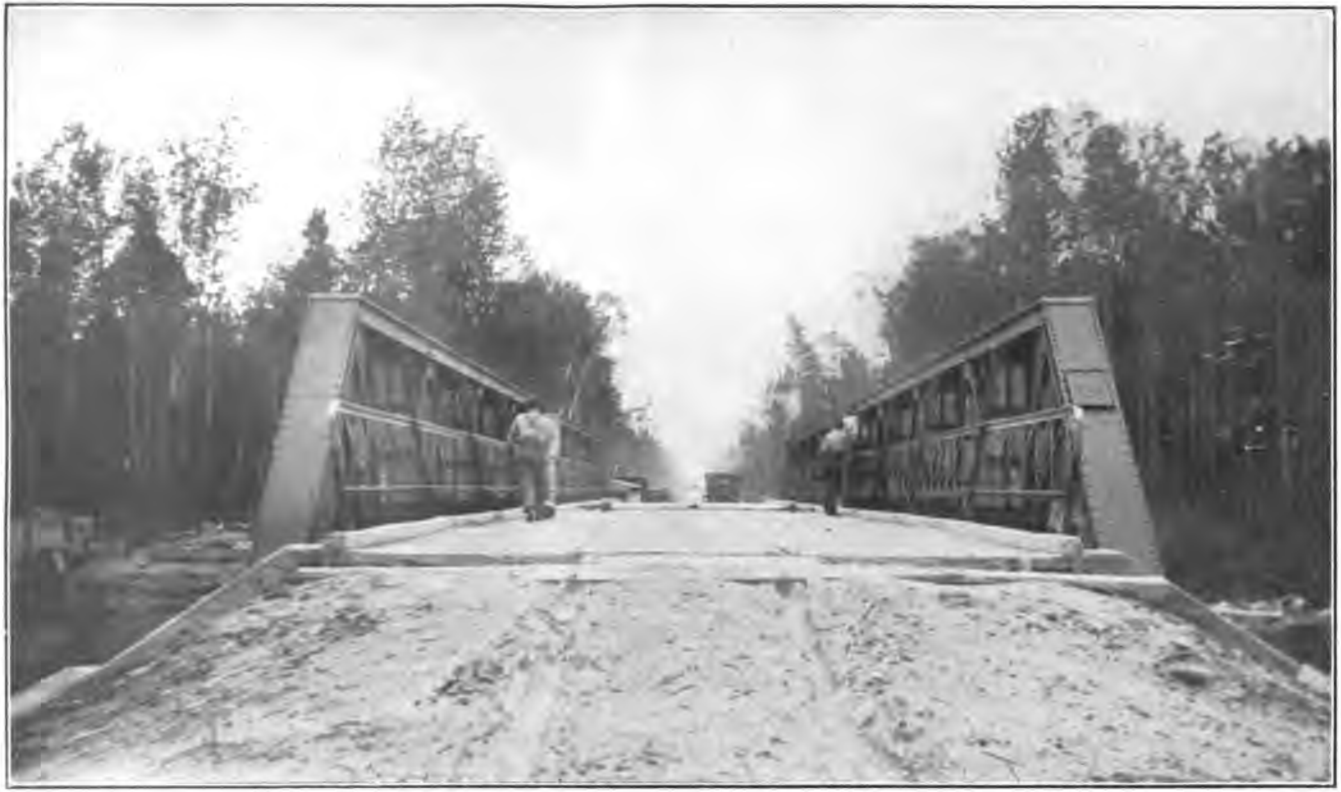
(1) CLAY-SAND ROAD.

First Course Clay.—Four inches of clay should be placed on the bed between the shoulders which have been previously prepared, taking care to spread it uniformly nine feet wide; over this should be crowded with the grader sufficient sand from the gutters and shoulders to make about two inches. This material should be thoroughly harrowed with a disc harrow until the sand nearly disappears into the clay and the clay works to the top, when it should be sprinkled or advantage taken of rains to rework it with a disc harrow to the consistency of mortar, adding additional sand from time to time during the working if the mixture is too muddy. This course should be floated into shape while it is drying out and hardening.

Second Course.—After the first course has been completed, another layer of sand of about one inch in uniform thickness shall be spread on the road, and over this a layer of clay shall be spread to nine feet in width and about three inches thick. Then sand from the sides shall be crowded on to the clay with the grader and the whole course worked with a disc harrow until the sand and clay are thoroughly mixed and no lumps appear. The road shall then be sprinkled or advantage taken of rains to again disc it to a mortar condition, additional sand shall be added and worked in and the road floated and shaped down during drying until a smooth, even surface is obtained, which will shed water and shall not become muddy under heavy rains, or disintergrate in dry weather. As the road is worn and rutted with travel, additional sand can be drawn in from the sides, the tendency of the clay on the bottom course being to come to the surface and form mud.

(2) LEAN GRAVEL ROAD.

First Course of Gravel.—After the road has been graded in the manner above described, a layer of gravel shall be spread on the prepared bed to such uniform thickness as to be not less than five inches deep after compacting. The gravel for this course shall consist of good, clean bank gravel, not less than forty per cent by weight, a larger per cent if possible, of which



Two span 170 foot low truss bridge over Pine river, Mackinac county.

shall be pebbles that will be retained on a screen of one-eighth inch mesh. If the road bed and shoulders are naturally sandy, clay gravel shall be used; if the road bed and shoulders are naturally heavy soil, sharp, sandy gravel shall be used. The gravel shall then be harrowed with a spike tooth harrow and rolled until no further compacting is possible. The rolling must be done only when the road has been well wetted by sprinkling or after rains. Any hollows that may develop in the gravel during the process of rolling shall be filled with the same kind of gravel and the rolling continued until the surface is uniformly smooth and hard and everywhere parallel to and three inches below the surface of the finished road. The crown can be preserved during construction by the occasional use of the grader or other suitable floating tools. Ruts formed by hauling over the gravel shall be kept filled by using the harrow twice or more every day, preferably just before quitting time both noon and night.

Second Course of Gravel.—The gravel for the second course shall consist of good, clean bank gravel forty per cent by weight, a larger per cent if possible, of which shall be pebbles that will be retained on a screen of one-eighth inch mesh and will pass through a screen of one and one-half inch mesh. Other requirements for gravel in this course are the same as specified for gravel in the first course. This gravel shall be spread on the road to such uniform thickness as to be not less than three inches deep after compacting, after which it shall be harrowed and rolled in the same manner as prescribed for the first course. Any depressions that may be formed during the rolling shall be filled with the kind of gravel prescribed for the second course and the road re-rolled until the surface is uniformly smooth and hard and everywhere conforms to the proposed grade and cross-section of the road.

(3) ONE COURSE GRAVEL ROAD.

Course of Gravel.—After the road has been graded and rolled in the manner above described, a layer of gravel shall be spread on the prepared bed to such uniform thickness as to be not less than five inches deep after compacting. The gravel shall consist of good, clean bank gravel, not less than sixty per cent by weight, a larger per cent if possible, of which shall be pebbles that will be retained on a screen of one-eighth inch mesh and pass through a screen of two inch mesh. The gravel course shall then be harrowed with a spike tooth harrow and rolled until no further compacting is possible. The rolling must be done only when the road has been well wetted by sprinkling or after rains. Any hollows that may develop in the gravel during the process of rolling shall be filled with the same kind of gravel and the rolling continued until the surface is uniformly smooth and hard and conforms to grade of the finished road. The crown can be preserved during the construction by the occasional use of the grader or other suitable floating tools. Ruts formed by hauling over the gravel shall be kept filled by using the harrow twice or more every day, preferably just before quitting time both noon and night.

Manner of Rolling.—Rolling shall be done only when the material has been suitably wetted by sprinkling or recent rains and shall at all times begin at the sides of the road, rolling lengthwise, gradually working toward the center. In the final rolling the whole surface of the roadway, including the shoulders, shall be rolled from ditch to ditch, and the whole road grade left in such perfect condition that water will flow without obstruction to the side ditches. Rolling may be done with a power roller, a heavy horse

shall be pebbles that will be retained on a screen of one-eighth inch mesh. If the road bed and shoulders are naturally sandy, clay gravel shall be used; if the road bed and shoulders are naturally heavy soil, sharp, sandy gravel shall be used. The gravel shall then be harrowed with a spike tooth harrow and rolled until no further compacting is possible. The rolling must be done only when the road has been well wetted by sprinkling or after rains. Any hollows that may develop in the gravel during the process of rolling shall be filled with the same kind of gravel and the rolling continued until the surface is uniformly smooth and hard and everywhere parallel to and three inches below the surface of the finished road. The crown can be preserved during construction by the occasional use of the grader or other suitable floating tools. Ruts formed by hauling over the gravel shall be kept filled by using the harrow twice or more every day, preferably just before quitting time both noon and night.

Second Course of Gravel.—The gravel for the second course shall consist of good, clean bank gravel forty per cent by weight, a larger per cent if possible, of which shall be pebbles that will be retained on a screen of one-eighth inch mesh and will pass through a screen of one and one-half inch mesh. Other requirements for gravel in this course are the same as specified for gravel in the first course. This gravel shall be spread on the road to such uniform thickness as to be not less than three inches deep after compacting, after which it shall be harrowed and rolled in the same manner as prescribed for the first course. Any depressions that may be formed during the rolling shall be filled with the kind of gravel prescribed for the second course and the road re-rolled until the surface is uniformly smooth and hard and everywhere conforms to the proposed grade and cross-section of the road.

(3) ONE COURSE GRAVEL ROAD.

Course of Gravel.—After the road has been graded and rolled in the manner above described, a layer of gravel shall be spread on the prepared bed to such uniform thickness as to be not less than five inches deep after compacting. The gravel shall consist of good, clean bank gravel, not less than sixty per cent by weight, a larger per cent if possible, of which shall be pebbles that will be retained on a screen of one-eighth inch mesh and pass through a screen of two inch mesh. The gravel course shall then be harrowed with a spike tooth harrow and rolled until no further compacting is possible. The rolling must be done only when the road has been well wetted by sprinkling or after rains. Any hollows that may develop in the gravel during the process of rolling shall be filled with the same kind of gravel and the rolling continued until the surface is uniformly smooth and hard and conforms to grade of the finished road. The crown can be preserved during the construction by the occasional use of the grader or other suitable floating tools. Ruts formed by hauling over the gravel shall be kept filled by using the harrow twice or more every day, preferably just before quitting time both noon and night.

Manner of Rolling.—Rolling shall be done only when the material has been suitably wetted by sprinkling or recent rains and shall at all times begin at the sides of the road, rolling lengthwise, gradually working toward the center. In the final rolling the whole surface of the roadway, including the shoulders, shall be rolled from ditch to ditch, and the whole road grade left in such perfect condition that water will flow without obstruction to the side ditches. Rolling may be done with a power roller, a heavy horse roller, a traction engine followed by a weighted field roller, if one of suitable strength to bear weighting to three or more tons can be obtained.

With any kind of a roller the spike-tooth harrow, preferably of the lever type, should be used as long as the teeth will penetrate the surface.

After July 1, 1915, no gravel surfaced roads will be accepted for state reward until a suitable road drag or float has been provided and arrangements made with some person living on or near the road, to keep it floated after rains until thoroughly compacted, so as to insure that the gravel packs down evenly and forms a surface free from humps and hollows. It is also desirable that at least 20 yards of gravel to each mile, be placed in a neat pile near the road, so that it may be used as may be required in filling hollows after rains.

CLASS B.—(GRAVEL) SINGLE REWARD AND TRUNK LINE.

Act 283, Public Acts 1909, as amended and Act 334, Public Acts 1913, as amended.

Grading.—The roadway shall be graded so as to strictly conform to the plans, cross-sections, and profiles of this road heretofore prepared by or submitted to and approved by the State Highway Commissioner.

The term "grading" shall include all cuts, fills and approaches of intersecting roads within the limits of the highway, the digging and shaping of all ditches and gutters to conform to stakes and cross-sections of the road as well as the proper forming of the gravel bed and shoulders. When the fill below sub-grade is not more than one foot the roadway between the ditches shall be thoroughly grubbed. Soft, spongy or boggy earth in the road bed shall be removed and the space refilled with suitable material.

In general, earth for the fills shall be taken from the cuts and in no case shall it be taken from the roadside if in so doing it becomes necessary to dig below the grade line of the ditches as shown on the plan. If the earth from the cuts is not sufficient to make the fills, suitable places where earth can be borrowed will be located by the officers in charge. Deep, wide or unsightly excavations along the side of the roadway will not be permitted.

No trees shall be removed from the roadside, except by special permission from the State Highway Commissioner.

The finished road shall be not less than twenty-four feet for trunk line roads or twenty feet on single reward roads, between and exclusive of side ditches or gutters and have a cross-section oval in form, with an average rise of one inch to the foot from the inner edge of such ditch or gutter to the center line of the road.

No gravel shall be placed on any portion of the road until the grading has been fully completed, checked and approved by the State Highway Commissioner, unless the same has been checked by an engineer in the employ of the county or township.

Drainage—The side ditches and gutters shall be of such size as the drainage requirements of the locality demand, and must be formed with true grades having sufficient incline to cause a free and uniform flow of water to the nearest natural outlets, which outlets must be improved where necessary so as to carry the water quickly away from the highway. The slope of the banks of open ditches shall be not steeper than one and one-half horizontal to one vertical.

Tile drains shall be laid where needed, at such places, of such kind and size, and on such grades as may be shown on the plans.

Catch basins, man holes, culverts and other drainage structures shall be built as shown on the plans and provided in the general specifications hereto attached. Concrete headwalls shall be built on all culverts.

Culverts or tile for private driveways and crossroads shall be of a suitable size to carry freely all water flowing in the ditches, crossed by such driveways. Commissioners must arrange for these culverts and see that they are placed before the road is accepted.

In clay soils trenches shall be cut on each side, through the shoulders, described in the next paragraph, making outlets into the side ditches for water that may collect under the gravel. Such trenches shall be eight inches or more in width and deeper than the gravel bed. They shall be placed at all low points in the grade and not farther than one hundred feet apart in retentive soils, and must be filled with coarse gravel when the first course of gravel is being placed. These trenches must be maintained in good working order until the road is completed and thoroughly compacted.

Gravel Bed and Shoulders.—After the road has been graded as above described the gravel bed shall be formed in the central part of the road grade as follows: Shoulders of firm earth or other suitable material shall be placed on each side of the gravel bed such distance as may be required by the plans. The shoulders shall extend to the side ditches or gutters at the same grade and curvature as required for the finished road. Where the road grade is high the shoulders may be formed by moving earth from the center of the present road grade to the sides or, if the grade is low, by crowning the present road grade by scraping earth from the sides toward the center, or, if sufficient suitable material cannot be had along the roadway, it shall be brought from other places along the line of work.

Rolling Sub-grade.—After the shoulders and gravel bed have been formed as above described the whole roadway shall be rolled until no more compacting is possible. The hollows developed by this rolling shall be filled with suitable material under the direction of the officers in charge and the roadway again rolled and left in solid and firm condition everywhere parallel to the finished roadway, the metal bed being eight inches below the finished grade and having the same crown. In deep mealy sand, where rolling is impracticable when subgrade is shaped, marsh hay, wet straw or fine brush shall be laid on subgrade to prevent the first course of gravel from mixing with the sand.

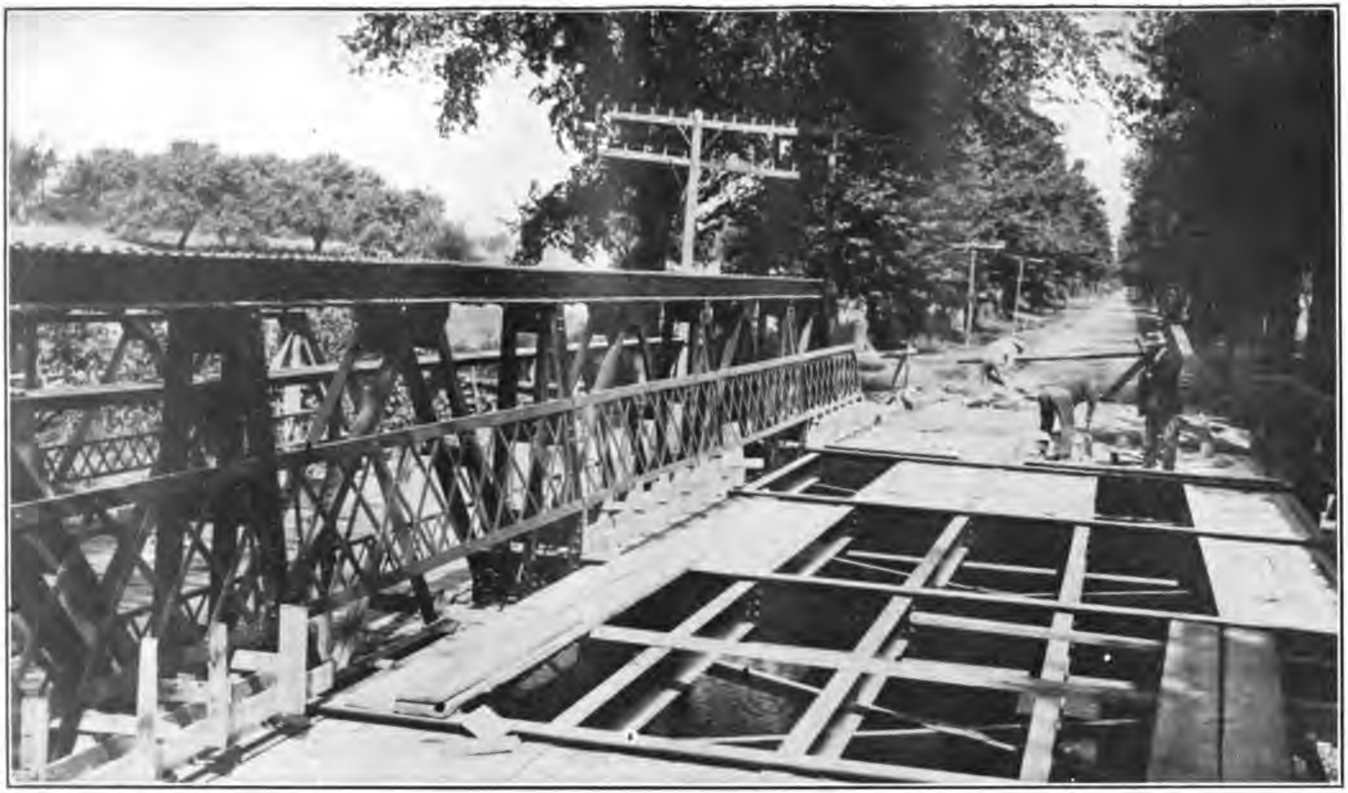
First Course of Gravel.—After the road has been graded and rolled in the manner above described, a layer of gravel shall be spread on the prepared bed to such uniform thickness as to be not less than five inches deep after compacting, six inches deep, loose measure. The gravel for this course shall consist of good, clean bank gravel, not less than sixty per cent by weight, a larger per cent if possible, of which shall be pebbles that will be retained on a screen of one-eighth inch mesh and pass through a screen of two and one-half inch mesh. If clay gravel is used, it should contain only clay enough to coat the pebbles, no free lumps. In no case should the clay exceed ten per cent of the mass, for clay makes mud and adds no wearing qualities. The gravel course shall then be harrowed with a spike tooth harrow, floated and rolled until no further compacting is possible. The rolling must be done only when the road has been well wetted by sprinkling or after rains. Any hollows that may develop in the gravel during the process of rolling shall be filled with the same kind of gravel and the rolling continued until the surface is uniformly smooth and hard and everywhere parallel to and three inches below the surface of the finished road. The crown shall be preserved during construction by the occasional use of the grader or other suitable floating tools. Ruts formed by hauling over the gravel shall be kept filled by using the harrow twice or more every day, preferably just before quitting time both noon and night. The bottom course of gravel shall be completed sufficient time in advance of the second course to be thoroughly compacted.

Second Course of Gravel.—The gravel for the second course shall consist of good, clean bank or screened gravel. For Single Reward roads, this gravel shall test sixty per cent by weight, a larger per cent if possible, pebbles that will be retained on a screen of one-eighth inch mesh and will pass through a circular screen with one and one-half inch holes. For Trunk Line Reward road, the gravel for this course shall test seventy-five per cent by weight pebbles that will be retained on a screen of one-eighth inch mesh and will pass through a circular screen with one and one-half inch holes. Other requirements for gravel in this course are the same as specified for gravel in the first course. This gravel shall be spread on the road to such uniform thickness as to be not less than three inches deep after compacting, four inches loose measure, after which it shall be harrowed and rolled in the same manner as prescribed for the first course. Any depressions that may be formed during the rolling shall be filled with the kind of gravel prescribed for this course and the road re-rolled until the surface is uniformly smooth and hard and everywhere conforms to the proposed grade and cross-section of the road.

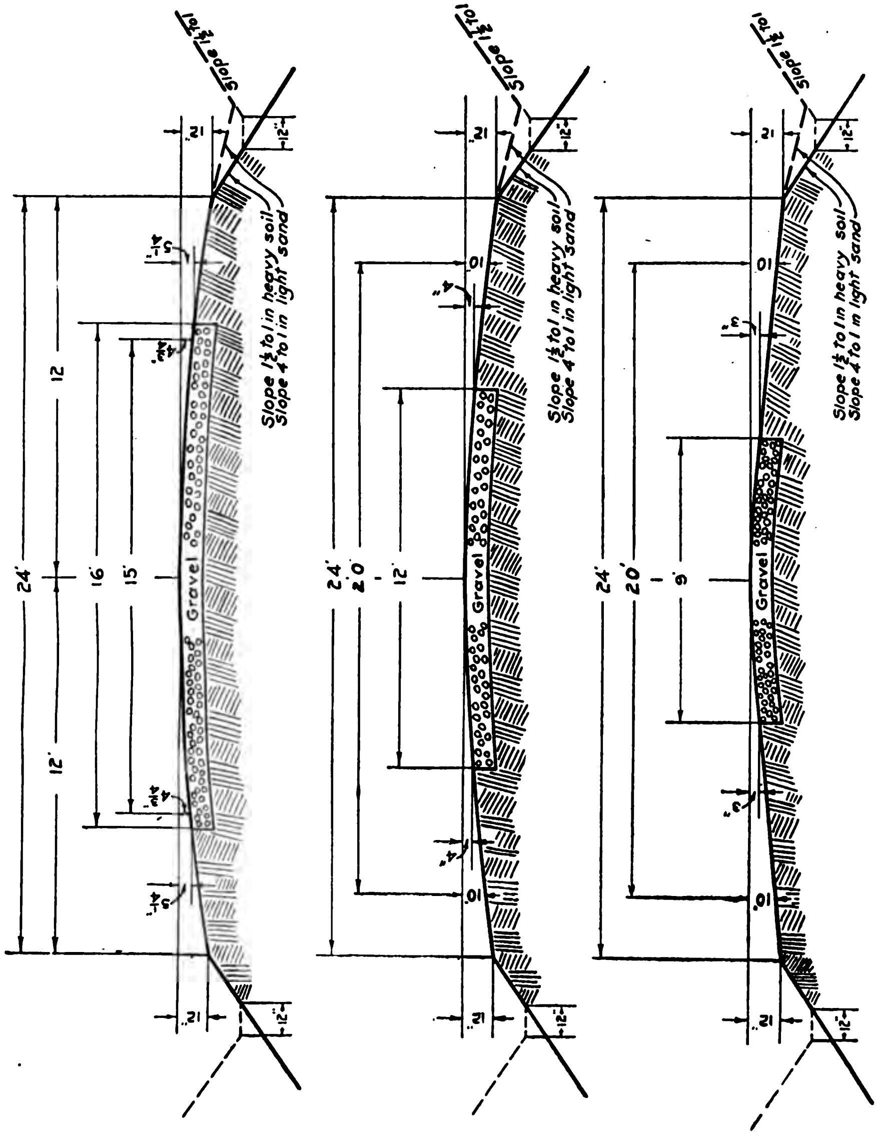
Manner of Rolling.—Rolling shall be done only when the gravel has been thoroughly wetted by sprinkling or recent rains, and shall at all times begin at the sides, rolling lengthwise of the road, but gradually working toward the center. In the final rolling the whole surface of the roadway, including the shoulders, shall be rolled from ditch to ditch and the whole road grade left in such perfect condition that water will flow without obstruction to the side ditches. Rolling may be done with a power roller, a heavy horse roller or a traction engine followed by a weighted field roller, if one of suitable strength to bear weighting to three or more tons can be obtained.

With any kind of a roller the spike-tooth harrow, preferably of the lever type, should be used as long as the teeth will penetrate the surface.

Condition of Acceptance.—No gravel surfaced road will be accepted for state reward until a suitable road drag or float has been provided and arrangements made with some person living on or near the road, to keep it floated after rains until thoroughly compacted, so as to insure that the gravel packs down evenly and forms a surface free from humps and hollows. It is also required that at least 15 yards of gravel to each mile be placed in a neat pile near the road, so that it may be used as may be required in filling hollows after rains.



A 75 foot low truss bridge built by the State Highway Department north of Coldwater in Branch county. Note the old trusses moved to one side to maintain travel during construction.


Slope 1½ to 1
12"
12"
Slope 1½ to 1 in heavy soil
Slope 4 to 1 in light sand
24'
12
12'
16'
15'
5¼"
4½"
Gravel
24'
20'
12'
10'
4"
Gravel
24'
20'
9'
10'
3"
Gravel

CLASS E.—(MACADAM) SINGLE REWARD AND TRUNK LINE.

Act 283, Public Acts 1909, as amended and Act 334, Public Acts 1913, as amended.

Grading.—The roadway shall be graded so as to strictly conform to the plans, cross-sections, and profiles of this road heretofore prepared by or submitted to and approved by the State Highway Commissioner.

The term "grading" shall include all cuts, fills and approaches of intersecting roads within the limits of the highway,the digging and shaping of all ditches or gutters to conform to stakes and cross-sections of the road as well as the proper forming of the macadam bed and shoulders. When the fill below sub-grade is not more than one foot the roadway between the ditches shall be thoroughly grubbed. Soft, spongy or boggy earth in the roadbed shall be removed and the space refilled with suitable material. No sods will be permitted in the stone bed.

In general earth for the fills shall be taken from the cuts and in no case shall it be taken from the roadside if in so doing it becomes necessary to dig below the grade line of the ditches as shown on the plan. If the earth from the cuts is not sufficient to make the fills, suitable places where earth can be borrowed will be located by the officers in charge. Deep, wide or unsightly excavations along the side of the roadway will not be permitted.

No trees shall be removed from the roadside, except by special permission from the State Highway Commissioner.

The finished road shall be not less than twenty-four feet for trunk line roads or twenty feet on single reward roads, between and exclusive of side ditches or gutters and have a cross-section oval in form, with an average rise of three-fourths inch to the foot from the inner edge of such ditch or gutter to the center line of the road.

No stone shall be placed on any portion of the road until the grading has been fully completed, checked and approved by the State Highway Commissioner, unless the same has been checked by an engineer in the employ of the county or township.

Drainage—The side ditches and gutters shall be of such size as the drainage requirements of the locality demand, and must be formed with true grades having sufficient incline to cause a free and uniform flow of water to the nearest natural outlets, which outlets must be improved where necessary so as to carry the water quickly away from the highway. The slope of the banks of open ditches shall be not steeper than one and one-half horizontal to one vertical.

Tile drains shall be laid where needed, at such places, of such kind and size, and on such grades as may be shown on the plans.

Catch basins, man holes, culverts and other drainage structures shall be built as shown on the plans and provided in the general specifications hereto attached. Concrete headwalls shall be built on all culverts.

Culverts or tile for private driveways and crossroads shall be of a suitable size to carry freely all water flowing in the ditches, crossed by such driveways. Commissioners must arrange for these culverts and see that they are placed before the road is accepted.

In clay soils trenches shall be cut on each side, through the shoulders, described in the next paragraph, making outlets into the side ditches for water that may collect under the macadam. Such trenches shall be eight inches or more in width and deeper than the macadam bed. They shall be placed at all low points in the grade and not farther than one hundred feet apart in retentive soils, and must be filled with course stone when the first course of macadam is being placed. These trenches must be maintained in good working order until the road is completed and so thoroughly compacted that the surface is water proof.

Macadam Bed and Shoulders.—After the road has been graded as above described the macadam bed shall be formed in the central part of the road grade as follows: Shoulders of firm earth, or other approved material, shall be placed on each side of the macadam bed, such distance apart as may be required by the plans and specifications. The shoulders shall extend to the side ditches or gutters at the same grade and curvature as required for the finished road. Where the road grade is high, the shoulders may be formed by moving earth from the center of the present road grade to the sides or, if the grade is low, by crowning the present road grade by scraping earth from the sides toward the center or, if sufficient suitable material cannot be had along the roadway, it shall be brought from other places along the line of work.

Rolling Sub-grade.—After the shoulders and macadam bed have been formed as above described the whole roadway shall be rolled until no more compacting is possible. The hollows developed by this rolling shall be filled with suitable material under the direction of the officers in charge, and the roadway again rolled, and left in solid and firm condition, everywhere parallel to the finished roadway, the macadam bed being such depth below the finished grade as may be shown by the plans and cross-sections. In deep mealy sand, where rolling is impracticable when sub-grade is shaped, marsh hay, wet straw or fine brush shall be laid on the sub-grade to prevent the first course of stone from mixing with the sand.

First Course of Macadam.—After the road has been graded and rolled in the manner above described a layer of crushed stone shall be spread on the prepared bed to such uniform thickness as may be specified by plans or special specifications for the road in question; not to be less than three and one-half inches deep at the edges and four inches deep in the center after thorough rolling and compacting.

The stone for this course shall be an approved grade of crushed limestone, cobbles, or trap rock.

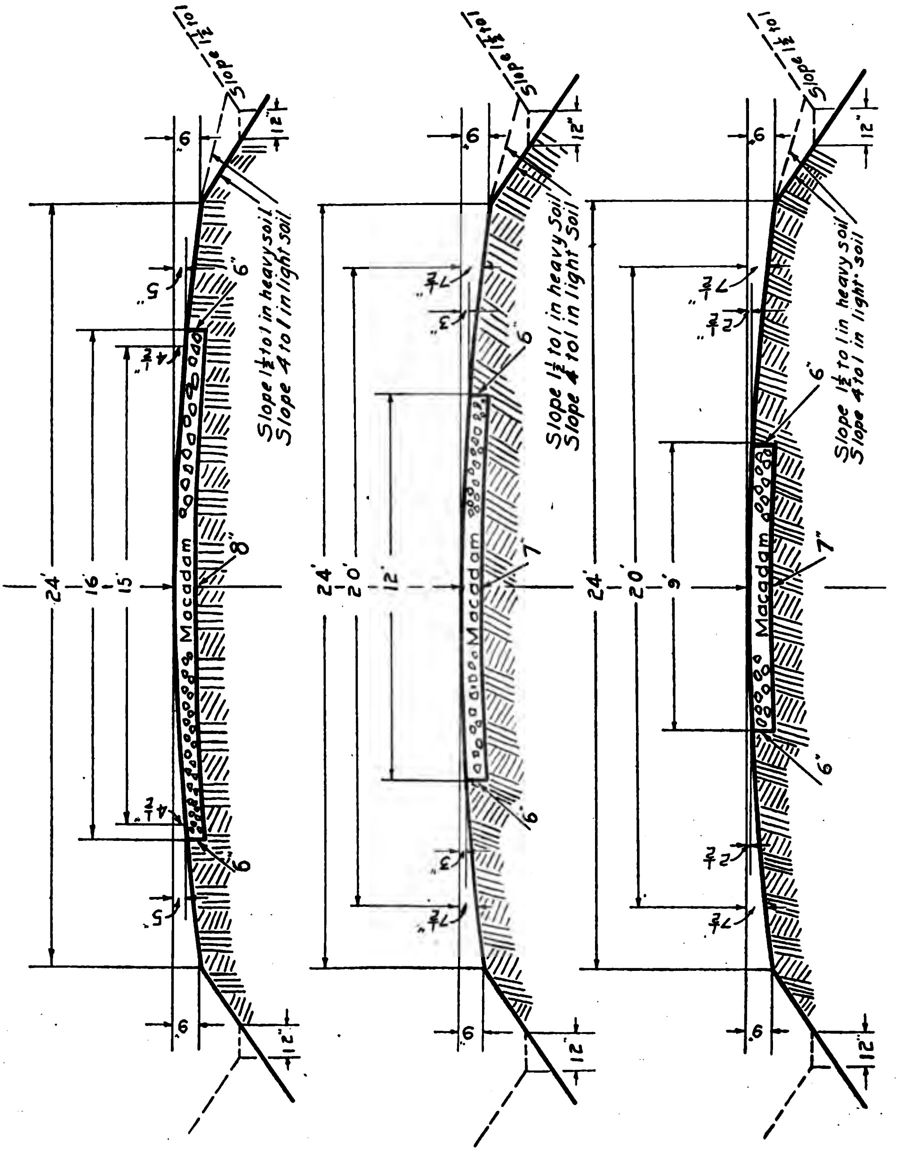
When limestone is used for this course, it shall consist of that part of the crusher product passing over the one and one-half inch section and through the three and one-half inch section of a cylindrical screen perforated with round holes.

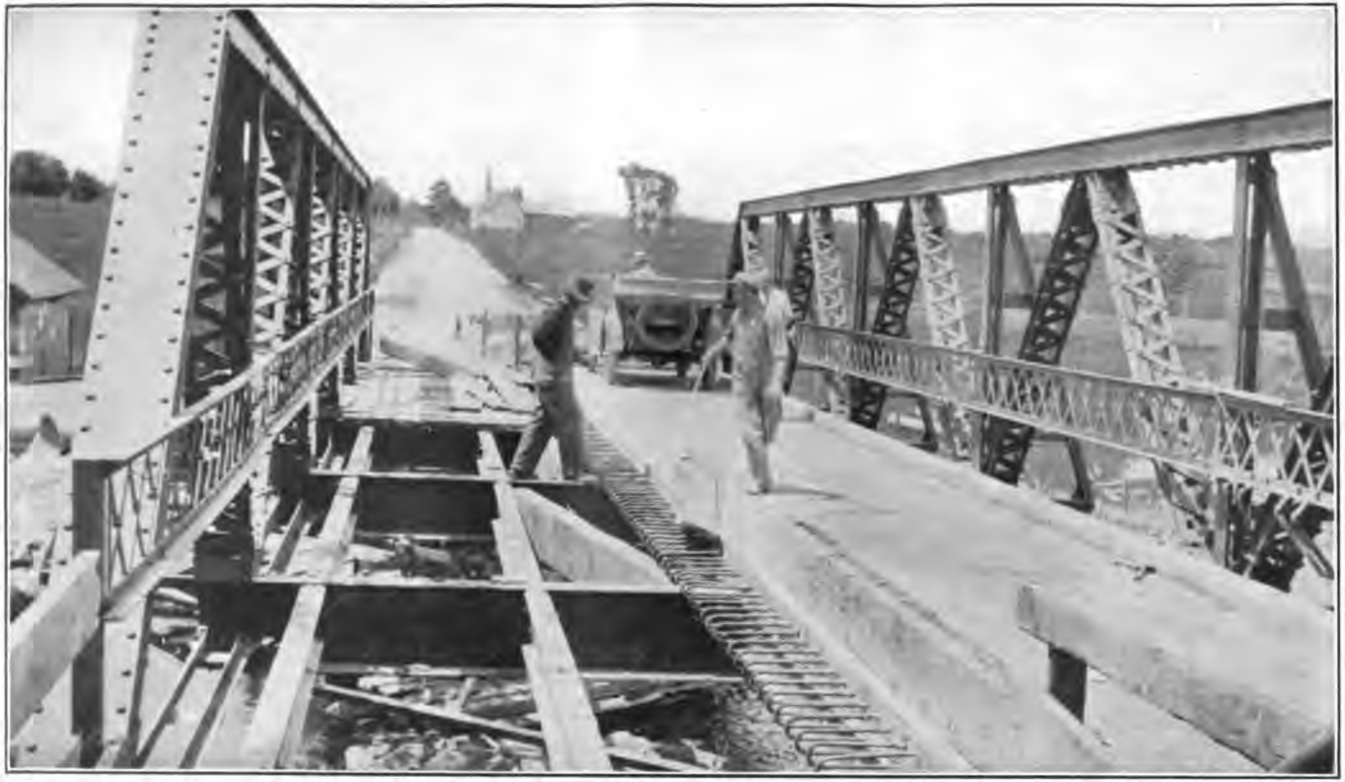
When cobbles or trap rock are used for this course it shall consist of that part of the crusher product passing over the three-quarter inch section and through the three inch section of the screen.

This stone shall be placed upon the road uniformly mixed, no patches of alternately large and small stone being allowed. Unless automatic spreading wagons are used, this shall be done by making several dumps of each load so that the least possible amount of handling with shovels and rakes will be required. In no case shall this course be laid on a muddy sub-grade.

Binder for First Course of Macadam.—After the stone has been spread as above described, it shall be rolled several times over with a roller weighing not less than ten tons, after which it shall be covered to the uniform depth of from one-half to three-quarters of an inch with stone screenings and re-rolled. The amount of binder used shall be somewhat less than enough to fill the voids in the stone. Water shall be applied in advance of the roller after the binder is added except on clay sub-grades where permission may be granted to omit the water. The rolling must be continued until the binder is worked into the crevices of the larger stones and the stones cease to sink or creep beneath the roller. If depressions are formed they shall be filled with stones of suitable grade, and not with screenings.

Stone screenings used to bind this course may be that part of the crusher product passing through the three-quarter inch section of the crusher screen when crushing the stone used for this course.





Whitefish River bridge at Rapid River, Delta County. Built by the State Highway Department. One-half of the floor is being poured at a time so as not to interfere with traffic.

Top Course of Macadam.—After the first course of macadam has been applied, rolled and bonded, as above specified, and the surface is free from earth and foreign material, another layer of crushed stone shall be added of such thickness as to bring the total depth of macadam up to the amounts specified in the special specifications or plans for this road. This thickness shall be not less than six inches at the edges and seven inches at the center for roads from nine to twelve feet in width, and eight inches at the center for roads from thirteen to sixteen feet in width. The top course shall be not less than three inches thick. All thickness to be measured after the road is thoroughly compacted and ready for acceptance.

The stone for this course shall be an approved grade of crushed limestone, cobbles or trap rock.

When limestone is used for this course, it shall consist of that part of the crusher product passing over the one and one-half inch section and through the three and one-half inch section of a cylindrical screen perforated with round holes.

When cobbles or trap rock is used for this course, it shall consist of that part of the crusher product passing over the three-quarter inch section and through the two inch section of the screen.

This stone shall be placed upon the road uniformly mixed, no patches of alternately large and small stone being allowed. Unless automatic spreading wagons are used, this shall be done by making several dumps of each load so that the least possible amount of handling with shovels and rakes will be required.

Binder for Top Course of Macadam.—After the stone has been spread as above described, it shall be rolled several times over until thoroughly keyed with a roller weighing not less than ten tons, after which it shall be covered to a uniform depth of about three-quarters of an inch with stone screenings. The screenings, when cobble or trap rock, may consist of that part of the crusher product passing through the three-quarter inch section of the crusher screen when crushing stone for the macadam top.

When limestone is used for the binder, the product shall consist of limestone chips ranging in size from three-quarter inch down, from which all but 20 per cent of the dust has been removed. Dust shall be considered that part of the screenings which pass through a wire screen having eight wires per linear inch.

Screenings used for binder in both courses shall not be dumped in piles on the loose stones but rather dumped on the shoulders and carefully spread on the road by hand, care being taken that the screenings be placed on the road evenly mixed. The screenings, after being applied gradually, shall be broomed over the surface during rolling. The amount of screenings used must completely fill the voids in the larger stones. This is best accomplished by casting lengthwise of the road rather than crosswise. Automatic spreading wagons may be used if an even spread can be obtained by their use.

Finishing.—After the screenings are added, water shall be applied with a sprinkler and the road rolled and watered until it becomes so hard that a piece of rock will crush beneath the roller before penetrating the surface. If depressions are formed they shall be filled with the smaller stones of suitable grade and not with screenings. During the progress of the work the screenings will disappear in places, when more screenings must be added and the rolling and sprinkling continued until the road has a uniformly hard and even surface, thoroughly bonded, and everywhere conforms to the proposed grade and cross-section of the road.

Manner of Rolling.—Rolling shall at all times begin at the sides of the road, rolling lengthwise but working toward the center. In the final rolling the whole surface of the roadway, including the shoulders, shall be rolled from ditch to ditch or gutter to gutter and the whole road grade left in such condition that water will flow without obstruction to the side ditches.

The roller used shall weigh not less than ten tons.

Condition of Acceptance.—Twenty tons of two inch stone must be stocked for each mile at a convenient point along the road or at the shipping point: This stone to be used for repairs during the first year after the road is built.

CLASS F.—ROADS (CEMENT-CONCRETE) SINGLE REWARD AND TRUNK LINE.

Act 283, Public Acts, 1909, as amended, and Act 334, Public Acts, 1913, as amended.

Grading.—The roadway shall be graded so as to strictly conform to the plans, cross-sections, and profiles for the road in question heretofore prepared by or submitted to and approved by the State Highway Commissioner.

The term "grading" shall include all cuts, fills, and approaches of intersecting roads within the limits of the highway, the excavation and shaping of all ditches or gutters to conform to the cross-sections of the road, and the proper forming of the road bed and shoulders. When the amount of fill from the original surface of the road to the sub-grade of the improved road is less than one foot, the roadway between the ditches shall be thoroughly grubbed. Soft, spongy or boggy earth in the roadbed shall be removed and the place refilled with suitable material.

In general, earth for the fills shall be taken from the cuts and in no case shall it be taken from the roadside if in so doing it becomes necessary to dig below the grade line of the ditches as shown on the plans. If the earth from the cuts is not sufficient to make the fills, suitable places where earth can be borrowed will be located by the officers in charge. Deep, wide or unsightly excavations along the side of the roadway will not be permitted.

No trees shall be romoved from the roadside, except by special permission from the State Highway Commissioner.

The finished road shall be not less than twenty-four feet between and exclusive of side ditches or gutters, and have a cross-section which is oval, parabolic or circular in form, with an average rise of one-fourth inch to the foot in the concrete roadway, and one and one-fourth inches per foot in the shoulders. For more details as to the manner of forming grades and ditches, see plans and profiles, and obtain instructions from the engineer in charge.

No concrete shall be placed on any portion of the road until the grading has been fully completed, and the grade checked and approved by the State Highway Commissioner, unless the same has been checked by an engineer in the employ of the county or township.

Drainage.—The side ditches and gutters shall be of such size as the drainage requirements of the locality demand, and must be formed with true grades having sufficient incline to cause a free and uniform flow of water to the nearest natural outlets, which outlets must be improved where necessary so as to carry the water quickly away from the highway. The slope of the banks of open ditches shall be not steeper than one and one-half horizontal to one vertical.

Tile drains shall be laid where needed, at such places, of such kind and size, and on such grades as may be shown on the plans.

Catch basins, man holes, culverts and other drainage structures shall be built as shown on the plans and provided in the general specifications hereto attached. Concrete headwalls shall be built on all culverts.

Culverts or tile for private driveways and crossroads shall be of a suitable size to carry freely all water flowing in the ditches, crossed by such driveways. Commissioners must arrange for these culverts and see that they are placed before the road is accepted.

In clay soils trenches shall be cut through the shoulders, one on each side, described in the next paragraph, making outlets into the side ditches for water that may collect under the concrete. Such trenches shall be eight inches or more in width and slightly deeper than the concrete bed. They shall be placed at all low points in the grade, and not farther than one hundred feet apart in retentive soils, and must be filled with crushed stone or coarse gravel.

Concrete Bed.—After the rough grading has been completed according to profile and cross-sections, the concerte bed shall be trimmed, thoroughly and evenly compacted, and brought to perfect grade form of uniform hardness. Hard places in the bed, such as old gravel and macadam must be sacrificed and made to conform in firmness with the rest of the sub-grade.

Rolling.—Before the concrete bed has been brought to the final grade, and when still a little high (the amount depending on the character of the materials in the road bed), the whole roadway shall be thoroughly rolled with a power roller weighing not less than ten tons, until no more compacting is possible. Hollows developed by this rolling shall be filled with suitable materials under the direction of the engineer in charge, and the roadway again rolled and left in a uniformly solid and firm condition, conforming to the true grades and cross-sections as shown on the plans. (See cuts on page 106).

Forms.—After the preparation of the concrete bed, forms consisting of 2″ x 6″ dressed plank or steel channels shall be placed on each side of the roadway, at the specified distance from the center line and such distance below the center line grade as is shown by the plans and profiles of the road. The forms shall be securely staked so that they will hold their true line and grade while the concrete is being placed and while it is hardening.

Concrete Roadway.—Upon the sub-base, prepared as hereinbefore specified, shall be laid a one course concrete pavement, not less than six inches thick, mixed in the following proportions, viz.:

American Portland cement....................	1 part.
Clean sharp sand............................	2 parts.
Clean broken stone, or gravel................	3½ parts.

Cement.—Only such Portland cement shall be used as conforms to the Standard Specifications for Portland Cement adopted by the American society of Civil Engineers, January 17, 1912, with the subsequent amendments thereto.

The contractor must notify the officers in charge and the State Highway Commissioner ten days in advance of the laying of concrete, of the brand of cement he proposes to use, and when it has been examined and approved, that brand or one of equal quality, which must also be approved by the State Highway Commissioner, shall be used throughout the work.

A sack of cement (94 pounds net) shall be considered to have a volume of one cubic foot.

The State Highway Commissioner may require that the cement be tested, and each shipment certified to by a reputable testing laboratory.

All cement delivered on the work shall be thoroughly protected from the elements.

Fine Aggregate.—The fine aggregate shall consist of sand, or screenings from hard, clean, durable quartz, trap rock or granite, graded from fine to coarse with the coarse particles predominating, and shall pass, when dry, a screen having one-fourth inch openings. It shall be clean and hard, and free from dust, loam, vegetable or other deleterious matter. Not more than 25 per cent shall pass a sieve having 50 meshes per lineal inch, and not more than 5 per cent shall pass a sieve having 100 meshes per lineal inch. In no case shall the fine aggregate contain frost or lumps of frozen material. Sands containing more than 3 per cent of clay shall be washed.

Coarse Aggregate.—The coarse aggregate shall consist of clean, hard, durable screened or washed gravel or crushed rock, having a French coefficient of wear not less than ten, free from dust, loam or vegetable matter and shall contain no soft, flat or elongated particles. It shall be graded in size from material retained on a screen having one-fourth inch openings and passing through a screen with two-inch openings. In no case shall the coarse aggregate contain frost or lumps of frozen material.

Water.—Water shall be clean, free from oil, acid, alkali or vegetable matter.

Measuring and Proportioning.—All material shall be measured in suitable boxes, or in wheelbarrows, of a measured capacity. Each wheelbarrow load shall be surface struck with a template.

The materials shall be mixed with sufficient water to produce a concrete which when deposited will settle to a flattened mass, but shall not be so wet as to cause a separation of the mortar from the coarse aggregate in handling.

Mixing.—The ingredients of the concrete shall be mixed to the desired consistency in a batch concrete mixer of an approved type, and the mixing shall continue until the cement is uniformly distributed and the concrete is homogeneous and uniform in color. Each batch shall remain in the mixer at least 45 seconds and have not less than 16 full turns of the mixing drum. The concrete shall be mixed with water above specified, wet enough to produce a concrete that will flush readily under light tamping.

Retempering or re-mixing concrete that is partially hardened will not be permitted.

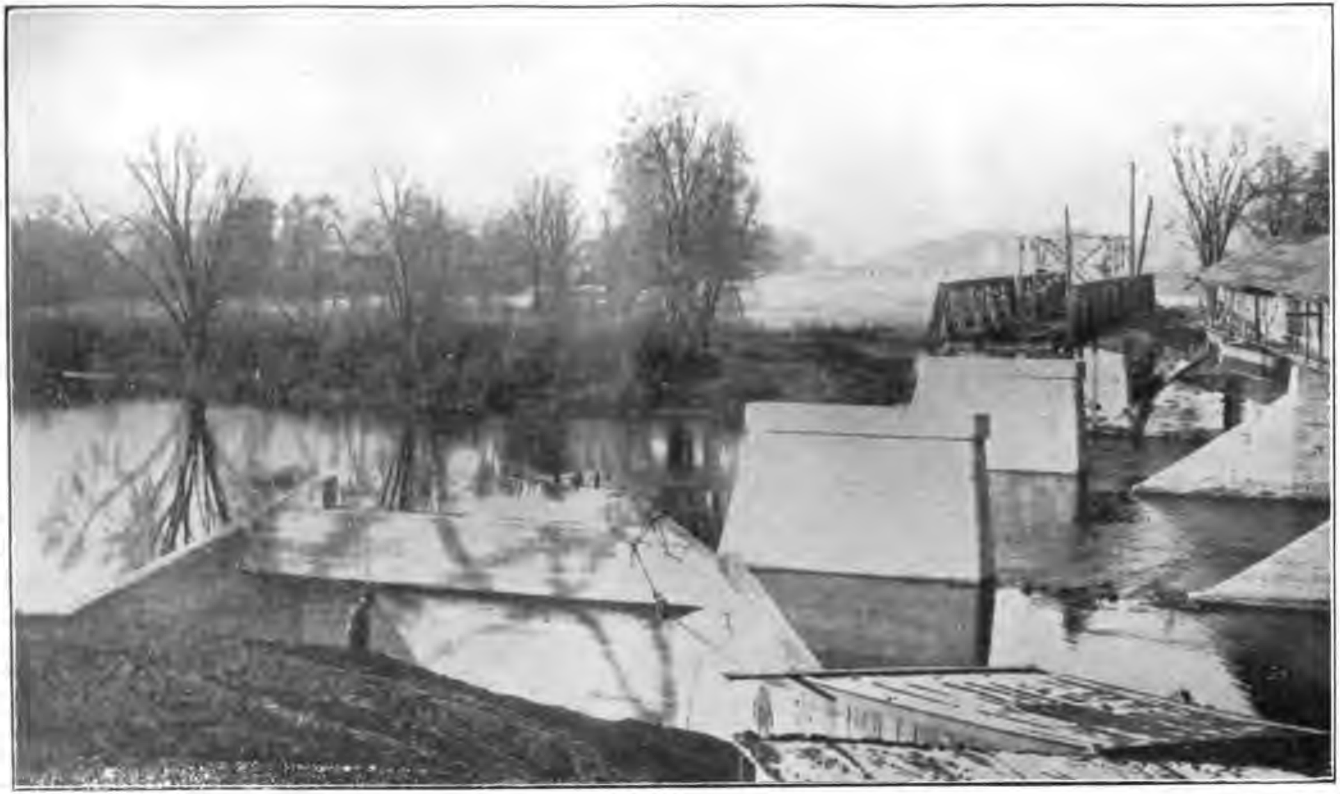
Depositing Concrete.—The concrete, prepared as above specified, shall be deposited in strips extending across the full width of the roadway, and shall be deposited as soon after mixing as practicable, and in no case shall more than fifteen minutes elapse between the mixing and depositing of the concrete.

Concrete shall be laid and finished from one transverse expansion joint to another, in one continuous operation, and the stoppage of concrete laying for more than thirty minutes, must be at an expansion joint, and the surface finished to that point.

The sub-base must be moist when the concrete is deposited.

Concrete shall not be laid when the tempearture at any time during the day or night falls below 35 above zero Fahrenheit.

Expansion Joints.—Vertical transverse expansion joints shall be placed



Construction view of a low truss bridge which is being erected by the Department over the Thornapple river in Ada township, Kent county.

across the entire width of the concrete roadway perpendicular to the center line where work is stopped more than thirty minutes. All joints shall extend through the entire thickness of the pavement and shall be perpendicular to its surface.

Joint Filler.—The joint filler shall consist of prepared felt, tar, asphalt or similar material of approved quality having a thickness of not less than one-fourth inch or more than three-eighths inch. The strips shall be at least one and one-half inches wider than the depth of the pavement and set so as to project at least one inch above the finished surface of the concrete.

Steel Protection Plates.—Steel protection plates shall be used when so specified by the officers in charge. They shall be not less than two and one-half inches in depth nor less than one-eighth nor more than one-fourth inch in thickness. The plates shall be of such form as to provide for rigid anchorage to the concrete. The type and method of installation of joint protection plates shall be approved by the engineer.

The surface edges of the metal plates shall conform to the finished surface of the concrete. All joints more than one-fourth inch high or low shall be removed and properly re-set.

Finishing.—After the concrete has been brought to the required grade by means of a suitable template, the surface shall be worked with a wood float, in such manner as to thoroughly compact it and to produce a smooth uniform surface. Before the concrete surface becomes hardened, it shall be slightly roughened by brushing with a stiff fibre broom.

Especial pains must be taken in finishing at the joints to prevent unevenness. A split float shall be used for this purpose.

Care must be taken in finishing not to step on the concrete. All work shall be done from a bridge made expressly for the finishers to work from. An approved finishing machine may be used to finish the concrete.

Before the concrete has thoroughly set, an edging trowel shall be used to round off the square corners to a radius of about one-fourth inch.

Removal of Forms.—The forms shall be removed when the concrete has set.

Protection.—After finishing, the surface shall be kept well sprinkled with water, and as soon as the concrete has hardened sufficiently, the surface of the pavement shall be covered with a thin layer of dirt or loam, which shall be kept wet at least five days by sprinkling with water, or the concrete may be flooded by using suitable dykes.

Under the most favorable conditions for hardening in hot dry weather, the pavement shall be closed to traffic for twenty-one days, and in cool damp weather, for an additional length of time to be determined by the engineer.

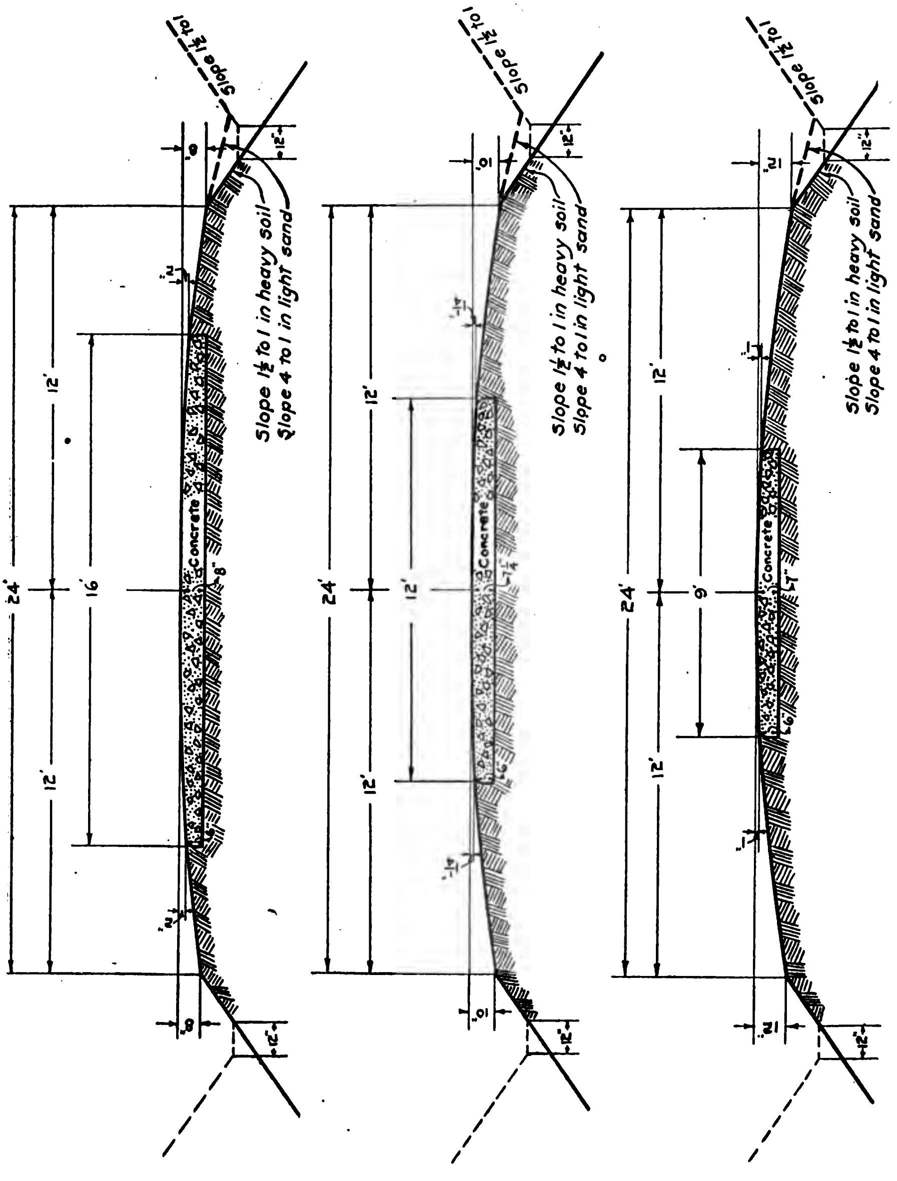
If, at the time the pavement is laid, or during the period of curing, the temperature during the day time drops below 45° Fahrenheit, sprinkling and covering of the pavement shall be omitted at the discretion of the engineer.

The contractor shall erect and maintain suitable barriers to protect the concrete from traffic and any part of the pavement damaged from traffic or other causes, occurring prior to its official acceptance, shall be repaired or replaced by the contractor at his expense, in a manner satisfactory to the engineer in charge. Two weeks after the pavement is opened to traffic, the covering shall be removed and disposed of as directed by the engineer.

Shoulders shall be placed along the margins of the concrete, extending to

the gutters or ditches, of such material, and of such form, as shall be shown on the plans and directed by the engineer in charge.

Inspection.—During the laying of the concrete pavement, the local officials shall provide for an experienced and competent inspector, who shall see that the specifications are carried out by the workmen. The qualifications of the inspector shall be such as to meet the approval of the State Highway Commissioner, and he shall be approved by said Commissioner.


Slope 1½ to 1
Slope 1½ to 1 in heavy soil
Slope 4 to 1 in light sand
Concrete
24'
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16'
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Slope 1½ to 1
Slope 1½ to 1 in heavy soil
Slope 4 to 1 in light sand
Concrete
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Slope 1½ to 1 in heavy soil
Slope 4 to 1 in light sand
Concrete
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1"
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6"

INSTRUCTIONS TO ENGINEERS AND SURVEYORS.

Surveyors and engineers making surveys and plans for state reward roads should give the following suggestions careful attention.

(1) In establishing center line of road, section and quarter corners must be found in place. If no permanent monument exists, corners must be established in accordance with rules of the Government survey and permanent monuments set.

(2) Stakes with hubs should be set one hundred feet apart along each side of the proposed roadway, uniformly twenty-five feet from the center line of the same.

(3) Levels should be taken at each station: (a) on the center line, (b) on the hub at each side stake, (c) in the bottom of each ditch, if there are any ditches. Plus levels should be taken on railroad tracks, on the floors of culverts and bridges, in the beds of streams that serve as outlets for road ditches, and at such other points as the survey may deem necessary.

(4) The plan and profile should be placed on the same sheet, projecting the plan vertically above or below the profile. Angles in the line may be indicated by the use of broken lines or small circles, giving the bearings and distances in figures without attempt at laying out with a protractor.

(5) The plan must contain a description in sufficient detail so that the road can be platted on township maps. The description must refer to section lines, quarter lines, section corners, quarter corners. Exact location of point of beginning with bearings and distances of the survey to the terminal must be given. In case of angling roads, where center line crosses section or quarter section lines, the station and plus at intersection and the distance from such intersection to the nearest section or quarter section corner should be noted on the profile. Permanent monuments to be set on center line at all angles.

(6) One hundred feet to the inch horizontal and five or ten feet to the inch vertical are desirable scales. No smaller scale than two hundred feet to the inch horizontal and twenty feet to the inch vertical will be allowed. Vertical and horizontal scales should always be noted on the profile.

(7) The profile must show at each station: (a) center line cuts and fills in figures, (b) the depth of each ditch or gutter in figures from the outer side hubs, (c) the distance in figures of the established grade above or below each line of side hubs. Tabulated cuts and fills on separate sheets are not desirable and will not be accepted in lieu of the profile. Cuts and fills should balance.

(8) Grade line should show elevation of finished road and not the subgrade. Points of change in proposed grade line should not be made abrupt, but angles should be rounded off with vertical curves. Avoid, if possible, the use of level grade line. At least six inches incline to one hundred feet is desirable. Elevations of stations at change points should be given referring to located bench marks.

(9) A complete working profile should show: (a) center line profile, (b) profile of each side ditch or gutter, (c) all the figures required to build the complete road as staked out.

(10) A typical cross-section should be shown. State law requires that

turnpike be at least twenty feet between and exclusive of side ditches with an average crown of one inch to one foot.

(11) At least three sets of plans must be prepared, one for filing with the township or county clerk, one for filing with the State Highway Department, together with the application for reward, and one for use of commissioner or foreman doing the work. Surveyors and engineers should provide themselves with application blanks for state reward roads and fill in description ready for the signing of the township board or county commissioners.

(12) All profiles must be approved by township boards or county road commissioners, before filing with the State Highway Department.

(13) It is desirable to prepare the original profile on tracing cloth, the surveyor or engineer retaining it, and as many prints as may be required can be furnished the township or county. Profile tracing cloth, Standard cross-section 10 x 10, is very convenient for this class of work and is recommended by the State Highway Department.

(14) Profiles, which do not in the main comply with these requirements, will be returned for corrections to the surveyor or engineer making the same. No application for state reward will be filed by the State Highway Department until both profile and application are approved by the Commissioner.

HOW TO USE ROAD PLANS AND PROFILES.

The plans and profiles for State Reward Trunk Line Roads are, under the law, made by the State Highway Department, the construction work on the road being done in accordance with these plans by the local township or county officials. In explanation of these plans we offer the following:

SURVEY.

The engineer who surveys the road, stakes it out permanently with two lines of hubs and markers set uniformly 25 feet back from the center line of the road, marking lines which are parallel to the center line. The hubs are small stakes about 1½-inches square, while the marker is a larger stake set back of the hub.

PLAN.

The drawings are made on cross section cloth in which the large squares measure one inch and the small ones one-tenth inch. Across the top of the sheet are the numbers representing the hubs or "stations," as they are called together with any distances noted between hubs which are written +; for instance, 26 + 50 means 50 feet from hub number 26, *measured in the direction of hub number 27*. Immediately below this line of numbers is located the plan of the road. On the plan are shown the location of cross roads, curves, culverts, guard rails, telephone poles and trees, United States land corners, buildings, etc., which are found within the boundaries of the road, as shown by the heavy lines or the light lines designating fences. Outside of the road lines are shown the farm buildings, creeks, ponds and other

Construction view of the Eastmanville bridge over the Grand river which is being constructed under the supervision of the Department by the Ottawa County Road Commission.

general features of the topography which may affect the grade of the road. Farm entrances of importance are shown.

PROFILE.

Below the road plan in the center of the sheet is the road profile. The center one of these profiles shows in a light irregular line the surface of the present road before grading. The even heavy line on the same base shows the new center line grade of finished road. The center line cuts and fills are shown directly above these two lines, marked (F) for fill and (C) for cut, which measurements are the actual measurements from the road as surveyed to the top of the finished road. The distance the finished center line is above the hubs, (marked +), or below the hubs, (marked −), on either side, is shown by the figures directly above the actual cuts and fills and directly below the center line profile. One line of figures being references to each hub line. To get the elevation of sub-grade one should go the depth of the metal below the point given by these figures. All figures on these plans are given in feet and tenths of feet. This enables the foreman or commissioner to refer his center line cuts and fills to hubs after grading operations have commenced.

Directly above the center line profile is found the ditch and hub profiles for one side. The light dotted line is the hub profile which is 25 feet back from the center line of the road. The uneven light line shows the present line of ditch or side profile of the road, and the heavy dark line is the proposed new ditch or gutter line. The figures right above these lines are the distances below the hub line, to which the bottom of completed ditch or gutter is to be dug. This also applies to the other ditch or gutter and hub line shown on the lower profile.

If any question arises as to what any profile line or figures refer to see notes on left end of each sheet.

LAYING OUT WORK.

Before starting grading operations the commissioner or foreman should go over the line of the road with the profile in hand, and set side grade stakes for all points where a fill is shown. These stakes should be of the correct length to drive in the ground so that the top will be just even with the finished grade. Then, as the work progresses, a sight can be taken across the tops of these stakes to tell how much more fill is necessary.

In cuts it is wise to keep track of plowings and the approximate depth of each, so as to tell when you are within 10 or 12 inches of sub-grade. Then dig a hole in the center of the road and drive a stake so that the top of it will be just flush with the sub-grade elevations. By these two methods, workmen can then be instructed to cut until down even with the top of the stake, and fill until up even with the top of the fill stakes.

For a convenient, cheap instrument for making these measurements we would suggest the use of a 10-foot pole, marked off in feet and tenths of feet, and a Mason's line level. These levels may be procured at hardware stores.

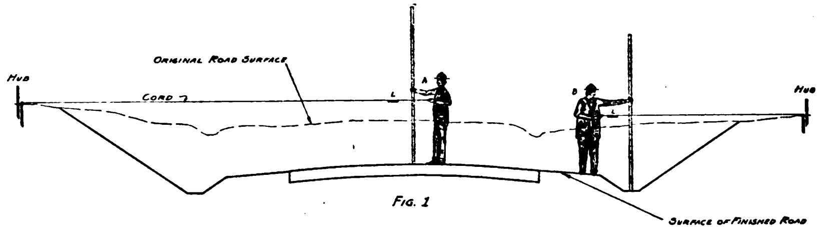

FIG. 1

In figure 1 A is shown checking the measurement from the left hub stake to the finished grade In his left hand he is holding a cord which is attached to the top of the hub stake, by means of a nail The cord is kept level by mean of an attached level vial at L In his right hand he is holding a rod graduated to feet and tenths. The reading shown by the cord on the rod should be the same as the figure shown on the profile for that station

"B" is shown checking the cut to the right ditch grade from the right hub in a similar manner.

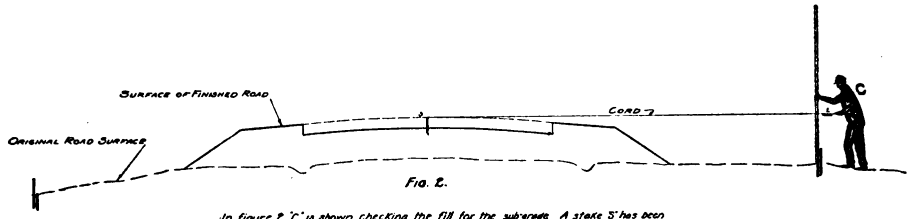

FIG. 2.

In figure 2 "C" is shown checking the fill for the sub-grade A stake "S" has been driven in the center of the road projecting 8 inches (for Class B) above the surface. In his left hand the man holds a cord with a level vial attached. The cord is also attached to top of stake "S". With his right hand he holds a rod, graduated to feet and tenths, on top of the hub stake With the cord kept level the reading on the rod should be that given on the profile for that station.

MICHIGAN STATE HIGHWAY DEPARTMENT
FIGURES SHOWING METHODS
OF
TAKING MEASUREMENTS FROM HUB STAKES

DRAWN BY [illegible] AUG. 29, 1913
APPROVED BY Leroy C. Smith
SCALE ¼" - 12" Deputy Commissioner.

SPECIAL FEATURES.

Culvert plans and small bridge plans are transmitted with each set of profiles for the necessary work along the line of that particular road. Wooden guard rails are specified for each unprotected fill which is more than six feet in height. The plans for these guard rails are shown on the road plan, and should be built of good cedar posts with sound, straight grained 2 x 6 rails. Guard rails should be painted with three coats of good white lead.

Finally we solicit correspondence relative to any point on plans or specifications which is not fully understood.

HOW TO MAKE APPLICATION FOR STATE REWARD.

In order to aid township and county officials in making application for reward, this department offers the following:

ORDINARY STATE REWARD.

To obtain State Aid in the building of ordinary reward roads, that is roads that do not fall on established trunk lines, it is necessary for the Township Board or Board of County Road Commissioners to meet and adopt a resolution making the application. This application is to be made on regular forms furnished by this department upon request. For townships Form AP2 is used while for counties AP1. (See Plate). The following should be noted in making out these forms:

In the blank following the word, "Class" the letter indicating the material to be used must be inserted. (For specification of different classes see pages 91-106). In the blank preceding the word "Feet," the width of the metal track should be inserted and not the width of turnpike. In describing the road the point of beginning should be referred to be section corners and ¼ posts. The direction of the road should be given with distances and the crossing of section or ¼ lines should also be noted. The point where the road terminates should be referenced by bearing and distances to some known government corner. In signing the application each member of the Township Board should place after his name the office he is holding and in the case of the Board of County Road Commissioners, the Chairman of the Board should add the word "Chairman" after his name. The road to be improved should be platted on back of application sheet.

Along with this application, the township or county as the case may be, must file a profile. This profile must be made from a survey of the road to be improved, by a competent engineer or surveyor. When the profile and application are approved by this department, the township or county will receive detailed acknowledgment. This notice will be their authority to start work according to specifications which will be sent with the same.

TRUNK LINE REWARD.

Application for trunk line reward can be made only on such lines as have been heretofore established by concurrent action of local officials and the State Highway Commissioner.

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across the entire width of the concrete roadway perpendicular to the center line where work is stopped more than thirty minutes. All joints shall extend through the entire thickness of the pavement and shall be perpendicular to its surface.

Joint Filler.—The joint filler shall consist of prepared felt, tar, asphalt or similar material of approved quality having a thickness of not less than one-fourth inch or more than three-eighths inch. The strips shall be at least one and one-half inches wider than the depth of the pavement and set so as to project at least one inch above the finished surface of the concrete.

Steel Protection Plates.—Steel protection plates shall be used when so specified by the officers in charge. They shall be not less than two and one-half inches in depth nor less than one-eighth nor more than one-fourth inch in thickness. The plates shall be of such form as to provide for rigid anchorage to the concrete. The type and method of installation of joint protection plates shall be approved by the engineer.

The surface edges of the metal plates shall conform to the finished surface of the concrete. All joints more than one-fourth inch high or low shall be removed and properly re-set.

Finishing.—After the concrete has been brought to the required grade by means of a suitable template, the surface shall be worked with a wood float, in such manner as to thoroughly compact it and to produce a smooth uniform surface. Before the concrete surface becomes hardened, it shall be slightly roughened by brushing with a stiff fibre broom.

Especial pains must be taken in finishing at the joints to prevent unevenness. A split float shall be used for this purpose.

Care must be taken in finishing not to step on the concrete. All work shall be done from a bridge made expressly for the finishers to work from. An approved finishing machine may be used to finish the concrete.

Before the concrete has thoroughly set, an edging trowel shall be used to round off the square corners to a radius of about one-fourth inch.

Removal of Forms.—The forms shall be removed when the concrete has set.

Protection.—After finishing, the surface shall be kept well sprinkled with water, and as soon as the concrete has hardened sufficiently, the surface of the pavement shall be covered with a thin layer of dirt or loam, which shall be kept wet at least five days by sprinkling with water, or the concrete may be flooded by using suitable dykes.

Under the most favorable conditions for hardening in hot dry weather, the pavement shall be closed to traffic for twenty-one days, and in cool damp weather, for an additional length of time to be determined by the engineer.

If, at the time the pavement is laid, or during the period of curing, the temperature during the day time drops below 45° Fahrenheit, sprinkling and covering of the pavement shall be omitted at the discretion of the engineer.

The contractor shall erect and maintain suitable barriers to protect the concrete from traffic and any part of the pavement damaged from traffic or other causes, occurring prior to its official acceptance, shall be repaired or replaced by the contractor at his expense, in a manner satisfactory to the engineer in charge. Two weeks after the pavement is opened to traffic, the covering shall be removed and disposed of as directed by the engineer.

Shoulders shall be placed along the margins of the concrete, extending to

across the entire width of the concrete roadway perpendicular to the center line where work is stopped more than thirty minutes. All joints shall extend through the entire thickness of the pavement and shall be perpendicular to its surface.

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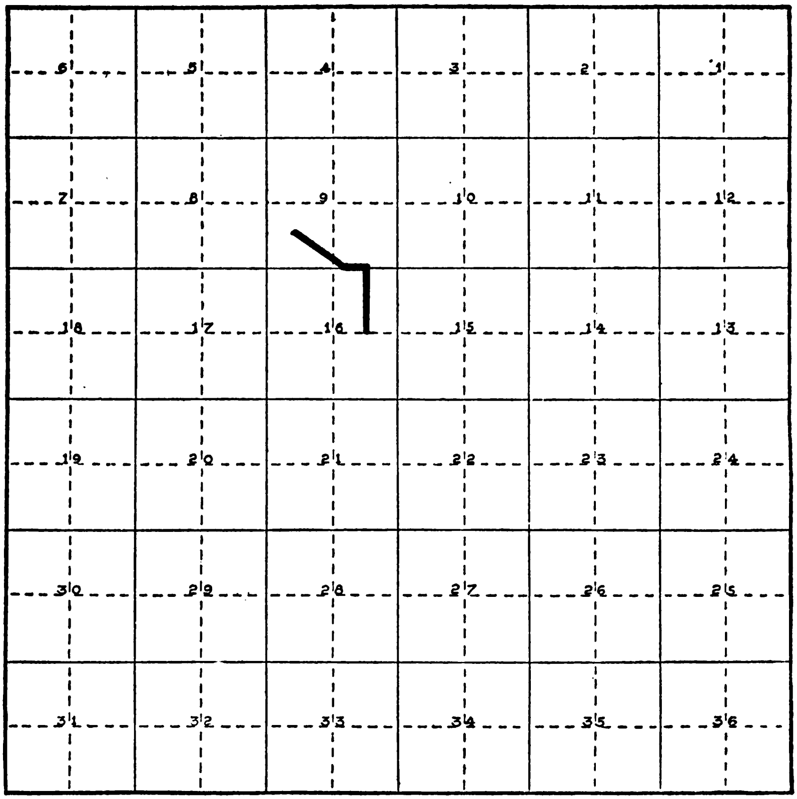
Shoulders shall be placed along the margins of the concrete, extending to

County Antrim

Township Central Lake

Town 31 North

Range 8 West



Application blanks furnished upon request, by State Highway Department, Lansing, Michigan.

SPECIFICATIONS FOR REPAIRS TO STATE REWARD ROADS.

GENERAL.

Roads of all classes, which need resurfacing, must be resurfaced during the summer or fall.

All damage to the shoulders by washing rains must be repaired.

All weeds and brush along the shoulders and in the ditches must be cut and removed from the roadway, or burned.

Where needed the ditches shall be cleaned out so as to give a free and uniform flow of water.

Outlets to road ditches must be cleaned out, if necessary, so as to remove all water from the road allowance.

THE ROAD DRAG.

For roads having earth or gravel surfaces (Classes A, B and C) suitable floating or dragging tools must be provided. They may consist of,—the plank drag or float, the log drag or most any of the steel drags now on the market.

Neither the four wheeled grader nor the double steel drags requiring four horses to draw, will be accepted in lieu of the road drag for this purpose. It may be necessary however, to use the four wheeled grader at times, especially when the frost is coming out of the ground in the spring, to smooth down humps and fill slight depressions in the gravel which the float will not do after the roads are once thoroughly compacted.

One drag or float must be provided for each continuous three miles of State rewarded road. If the road is four or five miles long two drags must be provided. A drag must be provided for each disconnected piece of road if the distance between the far ends is more than three miles, otherwise one drag may be used for the separate pieces driving it over the connecting piece of unimproved road in going from one road to the other.

GRAVEL FOR REPAIRS.

A quantity of gravel of the same quality as that used in the surface of the road and amounting to 20 cu. yds. for each mile of State rewarded road shall be delivered and compactly piled at some accessible point or points along the improved highway. A separate pile of gravel shall be placed on each disconnected highway, and not more than enough gravel for three miles of highway shall be placed in one pile. In no case shall the gravel be placed so that it is necessary to drive over an unimproved piece of highway to reach the road. Suitable gravel must be hauled out of the pit and placed along the highway, even though the pit is on the improved road.

PATCHING AND DRAGGING.

After placing the gravel and providing the road drags as above described, an arrangement must be made with some one living on the improved road or very close to it, to use the drag at the proper times, and to spread upon the road sufficient gravel to fill hollows and ruts when and where required. The following suggestions will be found helpful:

PATCHING.

This work is usually neglected or done in such a way as to cause two ruts to form where there was but one before. That is the invariable result of filling a rut too full. This work should always be done when the road is wet, preferably when the water is still standing in every little hollow on the road surface, so that the workmen can see just where to place the new gravel and about how much is required.

Unless the rut is a very large one, it is always best to shovel the gravel from the wagon into it, rather than to raise a side-board and attempt to dump a part of the load.

This kind of patching should never be done when the old road bed is hard and dry, for then the new material is soon ground into powder making dust and mud.

WHEN TO DRAG.

(1) Begin in the spring when the frost has left the ground and the road begins to dry, but while yet soft.

(2) Drag immediately after every prolonged rain throughout the season.

(3) Drag in the fall just before the ground freezes.

(4) Drag in the winter, if the frost leaves the ground. It will freeze smooth.

(5) Do not drag a dry road.

HOW TO DRAG.

(1) Hitch to the drag with a log chain, drawing it at such an angle as will crowd a little gravel towards the center of the road.

(2) If the drag cuts in too much, shorten the hitch; if too little, lengthen it.

(3) Let the team straddle the wheel track. Go down on one side and back on the other.

(4) Drive the team on a walk.

(5) Ride on the drag, unless the load is too heavy.

The success of this work depends solely upon the thorough manner in which it is followed up.

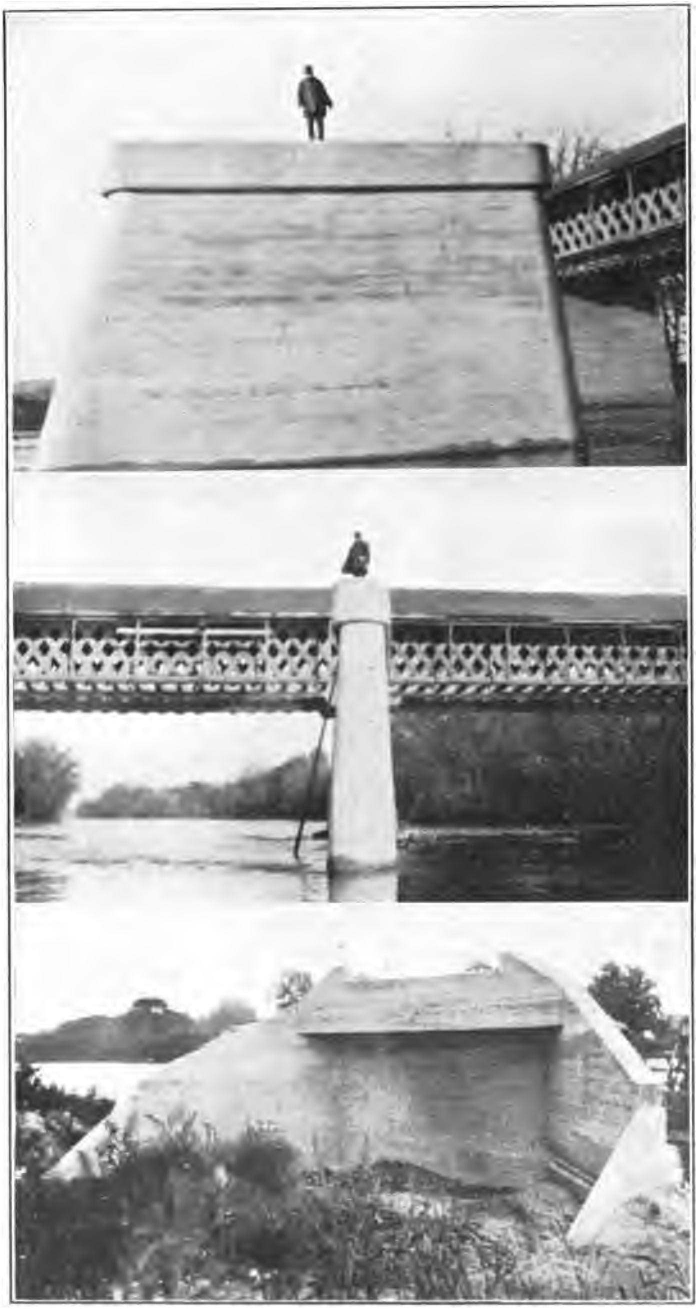
The telephone should be used to make sure that every man drags his beat on the appointed day.

On Class A roads of the sand-clay type the same materials (sand or clay, whichever was added to the original road) shall be provided, applied and dragged substantially as specified for gravel roads.

This year the repair money will be paid on Class A, B and C roads, unless they are so badly worn as to need a new surface, if the above requirements are compiled with.

REPAIRS FOR MACADAM ROADS.

On roads of Class E, all bad hollows and ruts shall be filled with No. 2 stone during the wet fall months. Where there is continued heavy hauling over the roads, as in the sugar beet growing sections, arrangements must be made to keep the ruts continually full, so as not to allow the macadam crust to break through at any point. This will necessitate the steady em-



Two views of a standard pier and a general view of a standard abutment for steel bridges.

ployment of some person with team to make repairs during the heavy hauling season of October and November.

Before the first of December, a quantity of No. 2 stone and screenings, in the ratio of four tons of stone to one ton of screenings, shall be delivered and stored at some convenient point on State rewarded macadam roads. Not less than sixteen tons of stone and four tons of screenings, free from dust, for each mile of macadam will be considered sufficient.

Compliance with the above requirements with suitable arrangements for applying the stone needed for repairs during the early spring months, will entitle macadam roads to State repair reward after December 1st, yearly.

CONCRETE ROADS.

Concrete roadways which are in good condition and along which the shoulders and gutters are in perfect repair, will be entitled to the State repair fund after December 1st, as are other roads.

APPENDIX "B"

PRINCIPAL AMENDMENTS TO THE HIGHWAY LAWS

MADE BY THE

1915 LEGISLATURE

AND

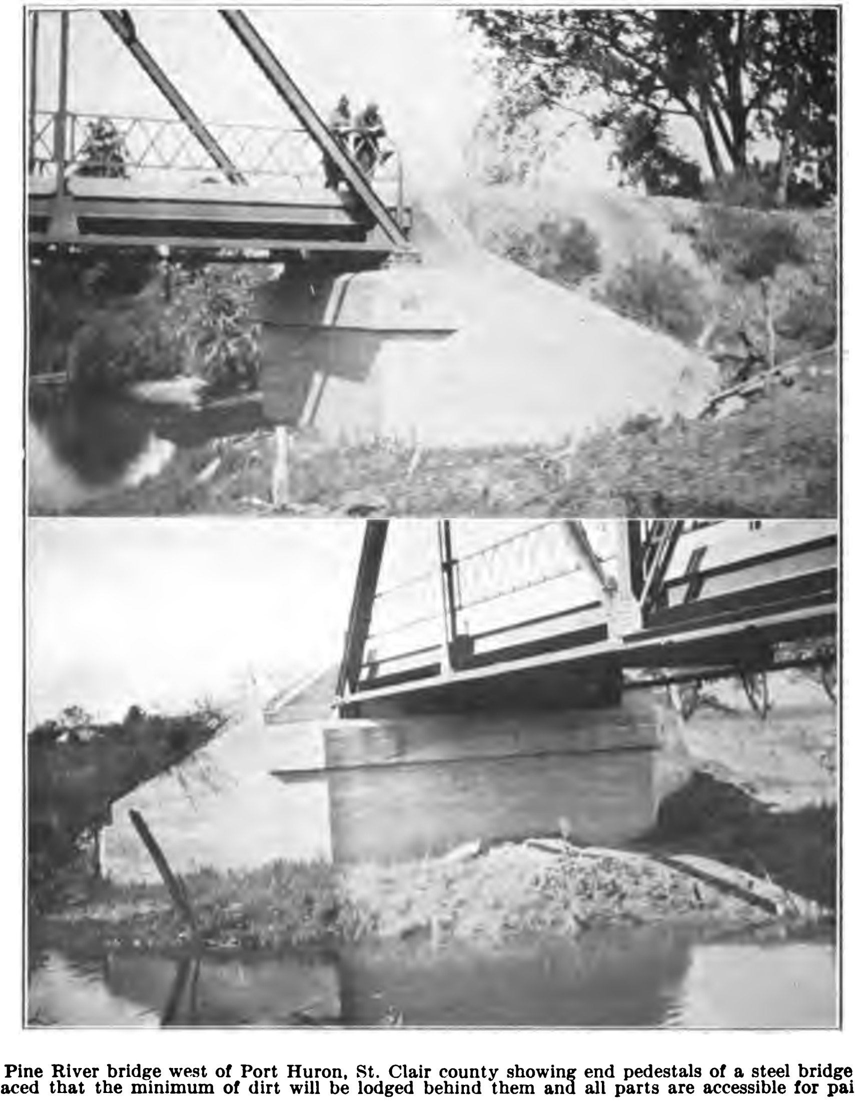
IMPORTANT DECISIONS OF THE ATTORNEY GENERAL

AMENDMENTS TO HIGHWAY LAWS.

CHAPTER I.

Separation of Grades.

SEC. 27. Before laying out any highway under the provisions of this act where the same crosses the track and right of way of any railroad company, steam or electric, application shall be made to the Michigan railroad commission for permission to make such crossing and thereupon it shall be the duty of said commission to make such examination of the location of such proposed crossing as it may deem necessary. At such examination the railroad company and the township, good roads district or county interested shall be entitled to be heard after the service of proper notice upon them by the Michigan railroad commission. If the location of the proposed crossing is found, upon said examination and hearing, to be feasible and reasonably safe for a crossing at grade, it shall be the duty of said commission to grant permission for such crossing to the highway officials making such application and issue specifications for same which shall include approaches, cattle guards, fences and such other safeguards as in their judgement will make said proposed crossing reasonably safe, but if, on examination and hearing, the Michigan railroad commission shall deem the proposed location for the said crossing extra hazardous, then the said commission shall notify the state highway commissioner and the said railroad commission and state highway commissioner acting jointly, shall examine the site of the proposed crossing, in company with the parties in interest, and shall have power, if in their judgment it is necessary, to cause a re-location of the proposed highway and crossing on a line which will provide a reasonably safe point for such crossing as a condition of approval of said application. However, if said Michigan railroad commission and state highway commissioner jointly, after examination, determine that it is impracticable to secure a reasonably safe crossing at grade by re-locating the same, they may order a separation of the grades, the same to be constructed according to plans which shall be submitted to the said railroad commission and state highway commissioner for their joint consideration and approval: Provided, That should such plans not meet with the approval of the railroad commission and state highway commissioner, such changes as they shall jointly deem advisable shall be made before the construction of said crossing is commenced. If the said railroad commission and state highway commissioner jointly determine that it is impracticable to secure a reasonably safe crossing by any of these methods, then the said railroad commission and state highway commissioner jointly may refuse to allow such crossing. If permission be granted for such crossing, either at grade or otherwise, the same proceedings in relation to acquiring the rights of way for such highway across the land of said railroad company including the right of way across the tracks shall be had as in other cases. Service of all papers shall be made in the same manner upon such railroad companies as is provided by law for service of summons on railroad companies. Such railroad companies shall be entitled to receive the actual value of the use of the land taken for such highway and when the compensation awarded such railroad company for such damages as above provided shall have been paid or tendered to any person in charge of the ticket or freight office of such company entitled thereto and situated nearest the said highway crossing pursuant to the provisions of section twenty-four of this chapter, then and in such case such right of way shall be deemed to be fully acquired and secured for the public. The highway officials shall then notify in writing such railroad company to furnish a competent superintendent or track man to superintend the construction of such crossing which shall be according to the plans and specifications approved by the Michigan railroad commission when such crossing is at grade and the Michigan railroad commission and state highway commissioner when such crossing is other than at grade and such township, good roads district or county shall pay to such railroad company a per diem compensation for such superintendent, the compensation to be determined by the Michigan railroad commission for a crossing at grade or the Michigan railroad commission and the state highway commissioner jointly, not exceeding three dollars per day, for a crossing other than at grade, for the time actually and necessarily spent in superintending such construction, and such highway officials are authorized to issue orders for the payment of such superintendent. In case such railroad company refuses or neglects to furnish a superintendent for the construction of such crossing as aforesaid, then and in such case it shall be the duty of the railroad commission, if such crossing be at grade, or the Michigan railroad commission and the state highway commissioner jointly, if such crossing be other than at grade to appoint some suitable person, who shall receive the compensation aforesaid from the said township, good roads district or county, to oversee and superintend the construction of such crossing. If any railraod company shall attempt to obstruct the opening of any such highway after such right of way has been secured and payment for damages herein provided for has been made and tendered as herein provided, by any agent, officer or employe or other person, the said railroad company shall be liable to a penalty of twenty-five dollars for each day the opening or construction of such highway is impeded, for the benefit of the township, good roads district or county, and such township, good roads district or county may sue for and recover such penalty in the circuit court for the county in which such crossing is located, in the name of the township, good roads district or county; and in addition thereto, if any officer, agent or employe, or person acting for and in the interest of any railroad company shall annoy, hinder or obstruct any highway official, contractor or person employed by him or them in opening such highway or constructing the same according to the specifications issued by the Michigan railroad commission or the Michigan railroad commission and the state highway commissioner jointly, then such officer, agent, employe or person shall be guilty of a misdemeanor and upon conviction thereof shall be fined not to exceed one hundred dollars, or imprisoned in the county jail not to exceed ninety days, or both such fine and imprisonment in the discretion of the court. All material and labor used in the construction of such crossing shall be furnished by the township good roads district or county applying for such crossing. No public highway shall hereafter be constructed across the track of any railroad corporation nor shall the tracks of any railroad corporation be con-



Pine River bridge west of Port Huron, St. Clair county showing end pedestals of a steel bridge so placed that the minimum of dirt will be lodged behind them and all parts are accessible for paint.

structed across a public highway without having first secured the permission of the Michigan railroad commission: Provided, That such crossing is proposed to be at grade. If other than at grade, permission shall be granted jointly for such crossing by the Michigan railroad commission and the state highway commissioner. The said railroad commission when acting alone, or the railroad commission and state highway commissioner when acting jointly, shall have the right to refuse permission or to grant it upon such terms and conditions as they may deem necessary for the preservation of public safety. The Michigan railroad commission and the state highway commissioner jointly shall have power, when in their judgment they deem it necessary for the safety of the public, to change the location of or abolish any existing crossing of railroads with highways and to require, when in their judgment it would be practicable, a separation of grades at any such crossing and to prescribe the manner of construction and the terms upon which such separation shall be made and the proportion in which the expense of the alteration or abolition of such crossings or the separation of such grades shall be divided between the railroad corporation and the state, county, good roads district or township: Provided, That no disposition shall be made of this matter until after all parties in interest shall have been afforded an opportunity to be heard in relation thereto. The state's portion of the cost of such changes as may be ordered by the provisions of this act shall in no case exceed twenty-five per cent of the total cost of such improvement and shall be paid from any state highway funds not otherwise appropriated, upon the certificate of the state highway commissioner to the auditor general: Provided further, That nothing in this section shall be so construed as vesting the state highway commissioner with authority in grade separation matters when proceedings are taken under and by virtue of act number ninety-two of the Public Acts of eighteen hundred ninety-three, as amended.

CHAPTER IV.

Election of County Commissioners.

Sec. 6. In any county where the county road system shall be adopted, a board of county road commissioners consisting of one or more, but not exceeding three commissioners as shall be determined by resolution of the board of supervisors, shall be elected by the people of such county. In the first instance such commissioner or commissioners shall be appointed by the board of supervisors or elected at a general or special election called for that purpose, as shall be ordered by the board of supervisors. If such commissioner or commissioners are appointed they shall hold office only until the first day of January in the year in which the next regular session of the legislature is held. If such commissioner or commissioners are to be elected at a general election, notice thereof, embodying a copy of the resolutions of the board of supervisors, giving the number and terms of office of the commissioner or commissioners to be elected, shall be published by the clerk in the newspaper or newspapers selected by the board of supervisors as required by section three of this chapter and act; if a special election is called for the election of such commissioner or commissioners, a like notice shall be given by the clerk, which notice shall be posted and published in such newspapers as required by said section three of this chapter and act. The regular election of county road commissioners shall be held at the general election on the first Tuesday after the first Monday in November, and the term of office of such county road commissioners shall commence on the first day of January in the year following their election. The notice thereof shall be given at the time notice is given of the general election of county officers: Provided, That the election of county road commissioner or commissioners, as herein provided, shall not be mandatory in any county which contains twenty surveyed townships or more, either entire or fractional as determined by the government survey thereof. In such county or counties the board of supervisors may, by a majority of its members-elect, appoint such county road commissioners.

Employment of County Highway Engineer.

SEC. 10. Neither the clerk nor any member of the board of county road commissioners shall, directly or indirectly, either personally or as a member of any firm or stockholder in any corporation, be pecuniarily interested as contractor or employe in any contract entered into or work carried on by or for such board or in property purchased or sold by or for such board: Provided, however, That this section shall not be construed to prevent the purchase of land for a road, from a member of the board or the clerk thereof. Said board of commissioners shall employ a competent county highway engineer who shall make all surveys ordered by the board, prepare plans and specifications for all roads, bridges and culverts, and exercise such general supervision over all construction as will insure that the plans and specifications are strictly followed: Provided, however, That two or more adjoining counties may employ the same engineer, if the work in one or more of such counties is not enough to employ the whole time of such engineer. Said board may also employ such other servants and laborers as may be necessary, and may purchase such machines, tools, appliances and materials as shall in its judgment be necessary or convenient for the proper carrying on of their work. The engineer employed by said board shall be officially known as the county highway engineer.

County Road Map.

SEC. 18. In case State reward is to be applied for, the board of county road commissioners shall file with the State Highway Commissioner for his approval, a map of the county showing the location of the proposed system of county roads: Provided, however, That this proposed system may be extended if approved by the State Highway Commissioner. All State rewarded roads composing a part of this system shall be taken over as county roads by the board of county road commissioners, and any road heretofore laid out, or any part thereof, shall become a county road if the board of county road commissioners shall at any time so determine, and in passing through or on the line between townships and incorporated villages or cities any streets or parts of streets of such village or city may be adopted as a county road, with the consent of the proper authorities of such city or cities, village or villages: Provided, however, That where any street or part of a street is taken over in passing through or on the line between a township and an incorporated village or city, no county road funds shall be expended for the improvement of any such street or part of a street of such village or city to a greater width than sixteen feet, nor with material more expensive than concrete or brick. The vote of the county road commissioners in respect to such determination shall be taken by yeas and nays, and shall be entered at large on the records of said board of county road commissioners. Notice of such determination shall be forthwith given by the clerk to the highway commissioner of each township and the highway authorities of each city or village in which said road or any part thereof is situated and published in some newspaper printed and circulated in the county, once in each week for three successive weeks. Proof of such service and publication may be made by affidavit by any person knowing the facts, and be filed with the clerk. Such affidavit or the record thereof, or a certified copy of such affidavit or record shall be prima facie evidence of its contents. After service and publication of such notice, the board of county road commissioners shall have sole and exclusive jurisdiction and control of such road so embraced within such determination, and the township or municipality within which the same is situated shall be relieved from all responsibility therefor. Immediately after laying out or taking control of a road said board shall give the same a name by which it shall be known in its proceedings. The board of county road commissioners of any county which has adopted the county road system is hereby authorized and empowered to, at any time, abandon and discontinue any county road, or any part thereof, by a majority vote. The vote of the county road commissioners in respect to such abandonment and discontinuance, shall be taken and entered, and notice thereof be given in the same manner as required in this section in cases in which roads are adopted. After proceedings to discontinue and abandon have been had, the jurisdiction and control of such road shall revert to the township or municipality within which the same is situated which, prior to the time of its adoption as a county road, had jurisdiction and control thereof, and the county shall be relieved from responsibility therefor.

CHAPTER V.

Maintenance of State Reward Roads.

SEC. 12. The State Highway Commissioner is hereby given authority to refuse to grant any further road reward to any township, good roads district or county that has been rewarded by the State which does not keep its State reward roads in proper repair; but upon his refusal to any township, good roads district or county for an allotment of State reward, it shall be the commissioner's duty to inform the proper officials of the repairs necessary to place it in a position to again be eligible to receive State reward, and if these repairs are made satisfactorily to the commissioner, he shall reinstate it to the eligible reward list. Should the township, good roads district or county fail to make the repairs ordered by the State Highway Commissioner within a reasonable time after being so ordered, then the State Highway Commissioner shall cause such repairs to be made and pay for them out of the reward money earned by such township, good roads district or county and it shall then become eligible to receive further State reward. Any balance remaining due to such township, good roads district or county after payment for such repairs shall be paid to such township, good roads district or county. If no reward is due said county, good roads district or township, then the State Highway Commissioner shall have authority to make the necessary repairs and pay for same out of the highway fund and render a bill for same to the proper officers of such county, good roads district or township, which bill shall be paid upon the warrant of such officers, and the amount thereof returned to the State Treasury to be credited to the highway fund and the supervisors shall include the amount in the next regular tax roll.

CHAPTER VIII.

Capacity of Bridges.

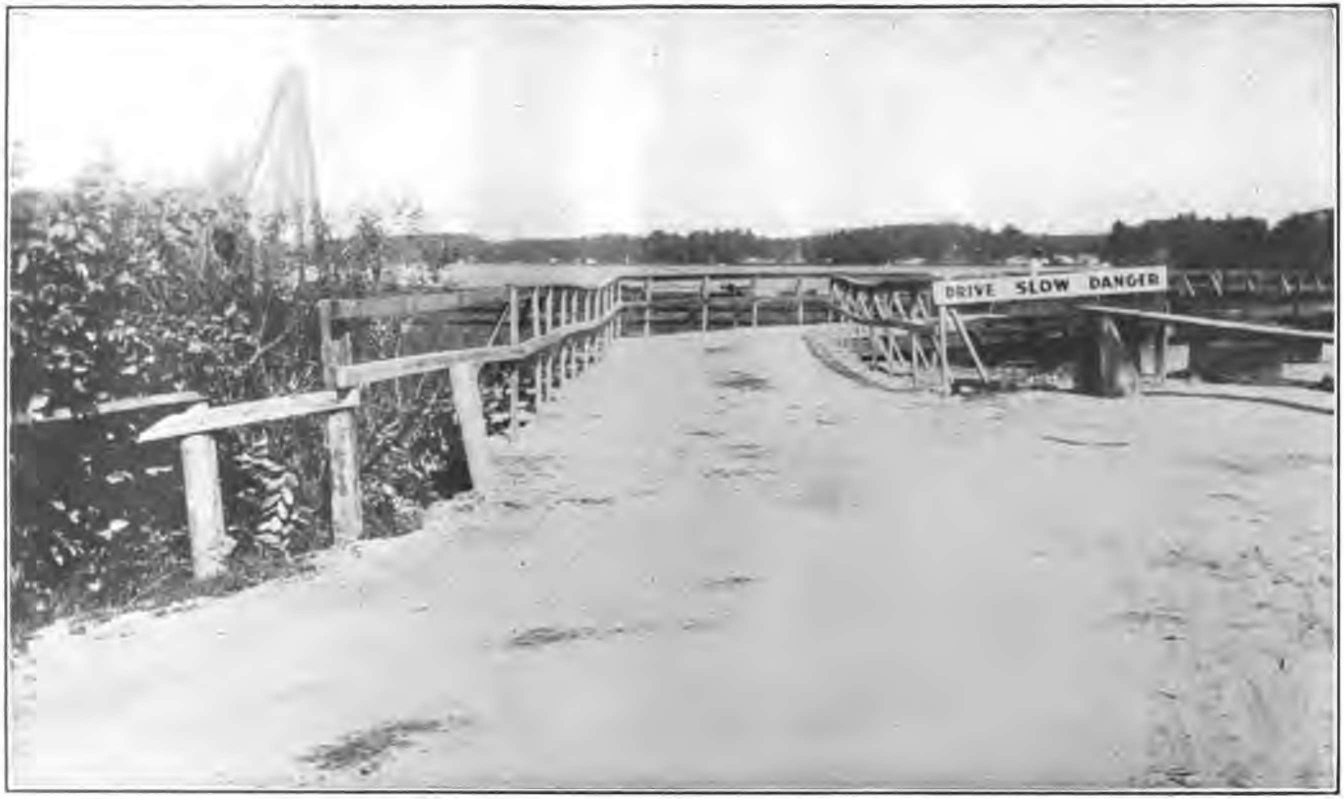
Sec. 13. There shall be no bridge, culvert or artificial roadway of any kind constructed in any public highway of this State, over any water course or railroad right of way thereof having a roadway of less than sixteen feet in width, and the same shall be built of sufficient strength to safely carry a fifteen ton moving load.

CHAPTER XV.

Drains.

Sec. 2. When any drain crosses a highway, the necessary bridge or culvert shall be constructed on the center line of the highway as located by survey, and in accordance with plans and specifications which shall be approved by the county, township or district highway commissioner having ing jurisdiction, and such bridge or culvert shall be of a permanent nature and of sufficient strength to safely carry a fifteen ton moving load. The cost of constructing the necessary bridge or culvert shall be charged in the first instance as part of the cost of construction of such drain after which such bridge or culvert shall be maintained as a part of the highway. When a drain passes along a highway, there shall be constructed at least one bridge or passageway across such drain connecting the highway with each enclosed field and with each farm entrance, which bridge or passageway shall also be charged in the first instance as a part of the construction of such drain, after which such bridge or passageway shall be maintained by the owner of the land.

Sec. 3. Before any drain shall be laid along a public highway, the highway commissioner of the township in which the drain is located shall be consulted and his consent as to the proposed location of the drain shall be obtained in writing, stipulating that no excavation may be made nearer than one rod to the center line of the highway and stating what disposition shall be made of all material excavated. It shall be the duty of the drain commissioner to level down all materials placed in the roadway.



Temporary bridge over Black Lake, two miles south of Muskegon on the West Michigan Pike. This temporary structure was built at an expense of nearly $1,000 by the State Highway Department to maintain without interruption the through travel during the construction of the bridge.

MOTOR VEHICLE LAW.

Act No. 302, P. A. 1915.

Section relating to the disposal of revenue received under this act.

SEC. 34. All fees paid to the Secretary of State as provided in this act shall be turned over to the State Treasurer and applied to the State highway fund, **the remainder* to be applied to the building and improvement of the highways of the State under such division of said fund and for such purposes as the highway laws of the State shall provide, to be paid out by the State Highway Commissioner in accordance with the statutory provisions therefor: Provided, That fifty per cent of the amount collected from the registered motor vehicles in each county shall be returned to the treasurer of each county, to be used to maintain the highways by the local authorities: Provided further, That in counties not operating under the county road system, the board of supervisors shall apportion such tax received to the several townships and cities according to the assessed valuation thereof, to be used by such townships and cities for the construction and maintenance of the highways. The Secretary of State shall certify to the Auditor General on January first of each year, or as soon thereafter as possible, the amounts received from the several counties for motor vehicle taxes under the provisions of this act for the preceding calendar year; the Auditor General shall thereupon draw his warrant on the State Treasurer for such amounts as are due the several counties under the provisions of this section. Any moneys remaining in either fund at the close of any year shall be carried over by the Auditor General and added to the funds which become available for the following year.

IMPORTANT DECISIONS OF THE ATTORNEY GENERAL.

STATE REWARD ROADS WITHIN INCORPORATED CITIES AND VILLAGES.

"* * * It is proposed that the county issue bonds for the purpose of building roads and if the proposition to raise money in such a way is carried, the county road commissioners desire to use a part of such money in constructing State reward road within the corporate limits of the City of Owosso. Section 18 of Chapter IV of the highway law was amended by Act 75 of the Public Acts of 1915 and in accordance with said section in its present form, State reward roads may be constructed by county road commissioners within the corporate limits of cities and villages. It is provided, however, that before any such road is taken over as a county road, consent of the proper authorities of said city or village must be obtained. In its amended form the section clearly contemplates that the county may receive the

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* The words italicized thought to be retained in error.

State reward upon such road improved in accordance with the prescribed regulations within the limits if a city or village. * * *

"The question is also raised as to whether or not the road must actually be taken over as a county road, the necessary consent by the municipal authorities therefor being given before the estimate and plans of the commissioners are submitted to and approved by the board of supervisors. I am impressed that this question must be answered in the affirmative. * * * I do not think, however, that the board of county road commissioners may properly prepare plans or estimates with reference to any portion of a highway within corporate limits of a city or village unless and until permission has been given to take over such highway as a county road and the board has formally decided to take such action.

" * * * Mr. Minor raises the question, however, as to whether a contract may be entered into between the city and the county road commissioners providing for such abandonment immediately after the improvement is made, which could be enforced. With reference thereto, I am constrained to the opinion that the matter of taking over or abandoning a particular road must be regarded as an official act and that the board of county road commissioners cannot contract or stipulate in advance what their action in such a matter would be.

"The county road law clearly contemplates that money raised within the county for highway purposes shall be expended by and under the direction of the board of county road commissioners. It would not, therefore, be legal to turn over to municipal authorities any portion of such money to be expended within the corporate limits in the improvement of city streets and highways. Neither would it be competent for the board of county road commissioners to surrender to municipal authorities the entire charge of the work being done on any county road. Such action would be an evasion both of the letter and spirit of the statute and, in my opinion, could not be sustained * * *.

"It is provided by the amendment to the highway law here involved that where any street or part of a street in a village or city is taken over, the same shall not be improved by the expenditure of county road funds to a greater width than sixteen feet. It is suggested in the instant case that such width would not be sufficient and that it would be desirable that the city construct additional pavement on each side. Such action would involve the levying of special assessments against the abutting property owners and the question is raised as to whether such action might be taken. Stated somewhat differently the point at issue is whether or not the city may assist in improving a certain street or highway within the corporate limits which has been taken over by the board of county road commissioners as a county road. It occurs to me that such suggested co-operation may not legally be carried out in the manner indicated. As before stated, when a street or highway is taken over, it thereby becomes a county road and in its improvement, the city as a separate corporation has no direct interest. Neither is it subject to the control of the municipal authorities. Such being the case, the raising of money under the charter for its improvement may not be sustained."

TRUNK LINE BRIDGES IN TOWNSHIPS AND INCORPORATED CITIES AND VILLAGES.

"It appears that some question has arisen as to the right of the state under section 4 of Act No. 334 of the Public Acts of 1913 to join with a city in building a bridge in a certain instance where the center of the bridge, and the stream spanned thereby, is the line between the city and township. I assume that the highway outside of the city in question is to be improved in accordance with the statutory specifications as a part of the State Reward Trunk Line highway system. It is also a matter of inference that either the county in which the highway is located is not operating under the county road system, or if that is the case, the board of county road commissioners has not seen fit to take over the municipal street as a county road. I conclude, therefore, that the burden of constructing and maintaining one-half of such bridge must necessarily fall on the municipality and such half may not be regarded as part of any state reward highway. The question at issue is, therefore, as to the right of the state to enter into contractual relations with the municipality and to construct such portion of the bridge as may be said to form a part of the state trunk line road.

"It is significant to note that the section of the trunk line highway act referred to above does not provide for any such situation as is suggested in the inquiry. A fair interpretation of the language that the legislature has used leads to the conclusion that the duty of constructing a bridge having a span of more than thirty feet is imposed upon the state when, and only when, all of such structure constitutes a part of the state reward trunk line highway. If any other view be accepted, it must follow as a matter of course that the state may, through the highway department, enter into contracts with municipalities with reference to the construction and maintenance of such a bridge. As before pointed out, however, such power is not given in express terms; nor do I believe that it may be implied from the provisions of the act as it now stands. Had the legislature intended that the authority and the duty of the state should extend to and embrace a bridge of this character, undoubtedly a specific provision would have been incorporated in the statute authorizing the making of necessary agreements and indicating the terms and conditions thereof. Inasmuch as the act is in this particular a departure from the policy of the state that has previously obtained, it occurs to me that we must construe strictly the provisions of Act 393 that are in question. It is my opinion, therefore, that the State Highway Department may not enter into agreements with a municipality providing for the construction of an intermunicipal bridge, a part of which is situated in a state reward trunk line highway."

STATE MAY CONSTRUCT BRIDGES WITHIN CITIES AND VILLAGES ON TRUNK LINE HIGHWAYS.

"* * * In the event that a city or village street is taken over as a county road in the manner prescribed by Section 18 of Chapter IV, I am impressed that it must be deemed, as a practical proposition, to lose its character as a municipal street in so far as its improvement under the direction of the County authorities is concerned. In other words, it must be regarded precisely the same as any other section of a county road lying wholly without the corporate limits of cities and villages. This view leads to the conclusion that bridges in any such portion of a coutny road which forms a part of a State line highway shall be constructed and maintained by the State if same have a span greater than thirty feet. It will be noted that Section 4 of the Trunk Line Highway Act contains no exception based on the location of any bridge, but on the contrary is declared to apply to all bridges having the required specification as to span and situated on any State reward trunk line highway. * * *"

THE STATE HIGHWAY DEPARTMENT CANNOT BUILD INTER-STATE BRIDGES.

"Your communication of recent date with reference to the construction by your department of an inter-state bridge over the Menominee River, between Dickinson county, Michigan and Florence county, Wisconsin, is before me. It appears that the terminus of the Dickinson county trunk line highway is the state line, which is the center of said river. The point at issue is as to your authority to enter into an arrangement with the Wisconsin authorities for the building of this bridge, the State of Michigan paying one-half of the cost thereof. * * *

"* * * In the absence of authority granted to you to enter into contracts with the proper authorities of other states, I am forced to the opinion that you may not properly do so. In the specific instance stated, therefore, inasmuch as you have not the authority to make the necessary agreements with the Wisconsin officials concerned, the authority to construct the bridge, or a portion thereof, must necessarily be denied."

TOWNSHIP ROAD BONDS.

There has been some difficulty in disposing of township road bonds because of the interpretation placed by some attorneys upon Section 26 of Article VIII of the State Constitution. This section gives to the legislature the power to provide for a system of constructing, improving, and maintaining highways throughout the state.

Section 26, Article VIII, says in part, as follows:

"The Legislature may provide by law for submitting the question of adopting a county or district road system to the electors of the counties or proposed districts, and such road system shall not go into operation in any county or district until approved by a majority of the electors thereof voting on such question. The tax raised for road purposes shall not exceed in any one year three dollars upon each one thousand dollars of assessed valuation for the preceding year."

The former Constitution specifically applied the limit of taxation to counties and from the above section it will be noted that the new Constitution has omitted mention of counties after the reference to assessed valuation. The Attorney General takes the view that it was the intention of the framers of the present Constitution that the limit of taxation had reference to the raising of money by counties rather than by townships and concludes his decision as follows:

"If bonds may be legally issued by any municipality or political subdivision of the State it would seem to follow from the decision of the Supreme Court in Hammond vs. Place, 116 Michigan 628, that the payment thereof can be compelled even though the prescribed tax limit is exceeded. Undoubtedly the principle of that decision is applicable in the instant case."

TIME OF ELECTION AND TERM OF OFFICE OF COUNTY ROAD COMMISSIONERS.

"It appears that the Board of County Road Commissioners is composed of three members whose terms of office will expire respectively May 1, 1917, May 1, 1919, and May 1, 1921. Previous to the enactment of Act 181 of the Public Acts of 1915, County Road Commissioners were chosen at the spring election. Said Act, however, amended Section 6 of Chapter IV of the Highway Law by providing among other things that: 'The regular election of county road commissioners shall be held at the general election of the first Tuesday after the first Monday in November, and the term of office of such county road commissioners shall commence on the first day of January in the year following their election.' In view of this amendment the question arises as to when the successor to the County Road Commissioner whose term will expire on the first of May 1917, should be elected and when such successor may claim the right to assume the office. The election of the successors of the other commissioners will of course be subject to the same consideration.

"In view of the provision of the statute above quoted it is obvious that no election of a road commissioner can be held at any time other than the general November election. Such being the case, I am impressed that the successor to your road commissioner whose term will expire in 1917 should be elected at the November election next fall (1916). * * *

"* * * It is significant to note that the statute makes no provision whatever for a commissioner who is chosen in accordance therewith to assume office at any time other than on the first of January following. * * * So viewed, the conclusion seems unavoidable that in instances similar to the case you have stated the Legislature has in fact shortened the terms of road commissioners holding office when the amendment of 1915 became operative, notwithstanding that the statute as it stood at the time of their selection in terms granted to them the privilege of holding their offices until the first of May of an odd year."

DUTIES OF TOWNSHIP HIGHWAY COMMISSIONERS WITH RESPECT TO THE PAYMENT OF MONEY FROM THE REPAIR AND IMPROVEMENT FUNDS.

The Attorney General was requested to rule on the following points:

1. Are the township repair and improvement order books to be held by the highway commissioner or by the township clerk?
2. Are the orders valid if drawn by the highway commissioner, detached from the stub in the book and presented to the township clerk for countersigning?
3. If the order book is held by the commissioner and an order drawn and presented to a third party who in turn presents it to the township clerk for countersigning, would it be considered valid and should it be honored by the township treasurer?

The Attorney General ruled as follows:

"* * * Section I of Chapter XIII of the General Highway Law * * * expressly requires the Township Clerk to have custody of all books and papers relating to the business of the Township Highway Commissioner, and this includes the order books. Your first question should therefore be answered in the affirmative.

"Your second and third inquiries, which may be treated together, should

APPENDIX "C"

STANDARD PLANS
FOR
BRIDGES AND CULVERTS.

STANDARD BRIDGE PLANS

This section contains a number of small electrotype prints of the standard bridge and culvert plans prepared for distribution among the county and township officials by the State Highway Department. Large blue prints of these plans may be had upon application.

As indicated on the title in the lower right hand corner and the number in the lower left of each plan, BN-4 shows standard concrete head walls for 12 to 36 inch pipe culverts. Print BN-3 shows the plan for standard reinforced concrete box culverts of from 18 to 36 inches in span. BK-8 and BK-7 are for spans of from 3 to 5 feet and 6 to 15 feet respectively. Tables are shown on the plans which give the estimated yardage and the steel sizes for the different spans.

Attention is directed to print BK-11 which shows the standard plain concrete abutment for heights up to 15 feet above the top of the footing and for widths of roadway of 16 to 20 feet. This abutment is suitable for use with I-beam spans with concrete floor and concrete T-beam spans, the plans for which follow. A plan is available for use with the standard through concrete girders with an 18 foot roadway and another plan for use with steel bridges having 16 and 18 foot roadways.

The print labeled BR-10 to 20 AS-18 is the standard reinforced concrete abutment for steel bridges. The drawing shows the abutment for an 18 foot clear roadway and for heights of from 10 to 20 feet. This abutment is suitable for any length of steel span up to 150 feet. Similar plans are made for steel spans of 16 foot roadway, for I-beam spans of 16, 18, and 20 foot roadway, for T-beam spans of 16 and 18 foot roadway, and for concrete girder spans of 18 foot roadway. This is an unusually good design as it is easier and more economical to build than either the cantilever or gravity abutments.

BR-18 F is the standard plan for concrete floors with I-beam span of 18 foot roadway and for lengths of beams of from 8 to 44 feet, to be used either with plain or reinforced concrete abutments. The I-beams used are not drilled, punched, or fabricated in any way, but are simply plain rolled beams cut to length and can thus be purchased at a minimum cost. A like design is prepared for 16 and 20 foot roadways.

BR-30-CG 18 and BR-50-CG 18 show the standard reinforced through concrete girders in spans of 30 and 50 feet respectively with an 18 foot clear roadway. Similar drawings may be had for spans of 35, 40, and 45 feet.

The standards for T-beam bridges are shown in print BR-24-TB-18. This is for a 24 foot span and an 18 foot width of roadway. Similar plans are prepared for 20 and 28 foot spans in both 16 and 18 foot roadway widths and the 24 foot span is also designed with a 16 foot roadway. On account of the present high cost of steel I-beams, this style of bridge may be more economically built than the I-beam type and is also of a more permanent character since it is of reinforced concrete throughout. The I-beam type is, however, easier to build and unless there is a county engineer or other competent official available to superintend the construction who is familiar with reinforced concrete work, the T-beam bridge is not recommended.

The standard pony truss designs of the Department are worthy of careful attention. The print shown here, BS-80-LT-18, is for an 80 foot span and 18 foot clear width of roadway. Designs are also prepared for 16 foot roadway widths for spans of from 50 to 100 feet, increasing by 5 foot lengths. Plans having an 18 foot width of roadway are available in span lengths of from 70 to 100 feet.

All pony truss designs have inside knee bracing at every panel point which, being connected directly to the floor beams between the trusses, gives greater stability to the trusses. The hand railing is connected to the battered braces as shown. There is greater weight in the floor beams but to offset this there is less weight in the inside knee bracing than in outside bracing on account of no horizontal member being required as in the outside brace. The added length of floor is not lost but provides a greater width of roadway. Although the nominal width of roadway may be but 18 feet measured from out to out of curb, there is actually about 19 feet clear width three feet above the crown and 20 feet at 6 feet above. All bulky or projecting loads make use of this extra width in passing and fast moving automobiles may safely drive up to the curb. The bridge is improved in general appearance and the cramped, uncomfortable feeling of driving too close to the truss members is removed. A 6 inch reinforced concrete floor is laid on this type of bridges The plans may be obtained from the Department.

Advice on bridge work, even to the extent of sending a man to make the survey and furnish plans and specifications for large bridges, is furnished by the Department free to townships and counties.

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